EZwave™ User's Guide

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Chapter 1
A Tour of the EZwave Viewer

The EZwave™ program provides dynamic graphical display of waveform data produced by a variety of Mentor Graphics® applications.

The viewer is designed to support observation and investigation of signal transition, "what-if analysis," or other areas of interest. Analog, digital and mixed-signal displays can be zoomed to a specified enlargement magnification, scrolled along the horizontal axis and measured between transition points (through the use of cursors and other featured utilities).

Provided with the EZwave viewer is an extensive online help system. Basic process flows are detailed along with menu operations and application interface orientation.

Joint Waveform Database (JWDB)

The EZwave viewer obtains waveform data by loading a database. By default, the EZwave viewer uses the Joint Waveform DataBase (JWDB) as its input format. Waveform data is collected from an analog/mixed-signal (AMS) simulator and stored in the JWDB, where it can later be loaded into the EZwave viewer. In the EZwave viewer, you can view a single database or multiple databases in a single session.

JWDB is a true mixed-signal waveform database. It can hold many different waveform types, including analog (float, double or complex), histogram, spectral, scatter, Verilog, standard logic, VHDL char, buses and records, bit, boolean, string, integer (16, 32, or 64 bits) and user-defined enumerated types. X-values can either be 64-bit integers or double-precision floating-point numbers. It can contain signals from the time and frequency domains, or any other domain that is needed.

JWDB is also a multi-run database. Waveforms and buses are stored, managed, and analyzed as *compound waveforms*. In addition to compound waveforms, JWDB has hierarchies which allow waveforms to be placed in folders for further data management.

Once you invoke the EZwave viewer, you can load the database by selecting **File > Open**. The waveform information appears in the left pane (also known as the Waveform List Panel) where it can be viewed, analyzed, and post-processed by utilities provided by the EZwave user interface.

The next section describes the EZwave user interface in further detail.

A Visual Tour of the EZwave Viewer

The EZwave viewer uses an advanced graphical user interface that supports viewing multiple waveforms and databases through:

- A Waveform List panel displaying the database in either a hierarchical (tree) format or flat (list) format
- The ability to add waveforms to multiple Graph windows
- Tabbed Workspaces for organizing windows

You can save the database along with your Graph windows at any time for later viewing. Displayed waveforms can also be printed locally.

Waveforms can be dragged up and down within the Graph window or overlaid for comparison display. Minimum and maximum axis values and data scale can be changed easily. Additionally, the viewer provides dual-axis display to support overlaid plots.

The EZwave viewer also facilitates with signal transformation utilities that can be used to analyze and verify analog, digital, and mixed-signal designs. Waveforms in voltage can be converted to logic states. A digital bus can be split to individual bits, and multiple bits can be combined to form a digital bus. Waveforms in the time domain can be transformed to frequency domain and waveforms in the frequency domain can be transformed back to time. The EZwave viewer can also display a histogram of a waveform (as well as other statistical measurements).

Figure 1-1 describes the main EZwave interface.

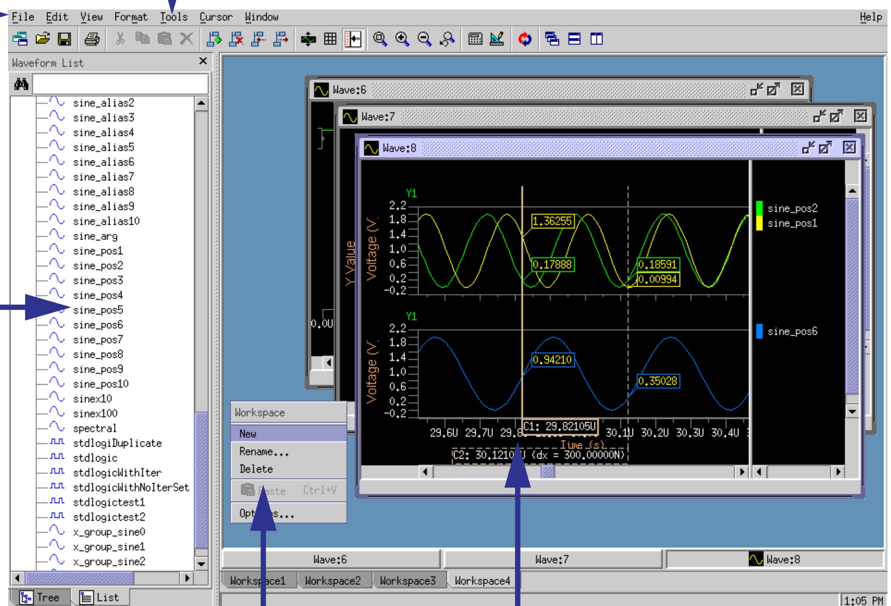
The sections following describe important elements of the EZwave interface in greater detail, including:

- Waveform List Panel and Workspace
- Graph Window
- Cursors
- Event Search Tool
- Measurement Tool
- Waveform Calculator

The complete interface description can be found in the online help (select **Help > Contents and Index** and open the **Application Interface Overview** from the Table of Contents).

Figure 1-1. EZwave Main Interface

1 **Load Data:** Select **File > Open** to open a database containing waveform data. Typically, this is in JWDB format.



2 **Add Waveforms:** Once the database is loaded, the waveforms appear here.

Drag waveforms from this Waveform List Panel and drop them into the open Workspace to invoke a new Graph Window (or drop them into an existing Graph window for a multi-row display or overlay).

3 **Analyze Waveforms:** In the Graph Window(s), add Cursors to measure different points in the waveforms.

Right Mouse Menus: As a shortcut to EZwave actions, right-mouse click on different areas of the EZwave interface to invoke a popup menu of options related to that area's context.

Mouse Strokes: Use the middle mouse button to perform tasks by simply drawing shapes (see the **Help > Keyboard and Mouse** help topic for a complete list) using the mouse. For example, drawing the letter "D" deletes the current set of selected objects.

4 **Post-Process Data:** After collecting waveform data, use tools provided to help you post-process this data. They include the Waveform Calculator (accessed from the **Tools** menu or icon bar).

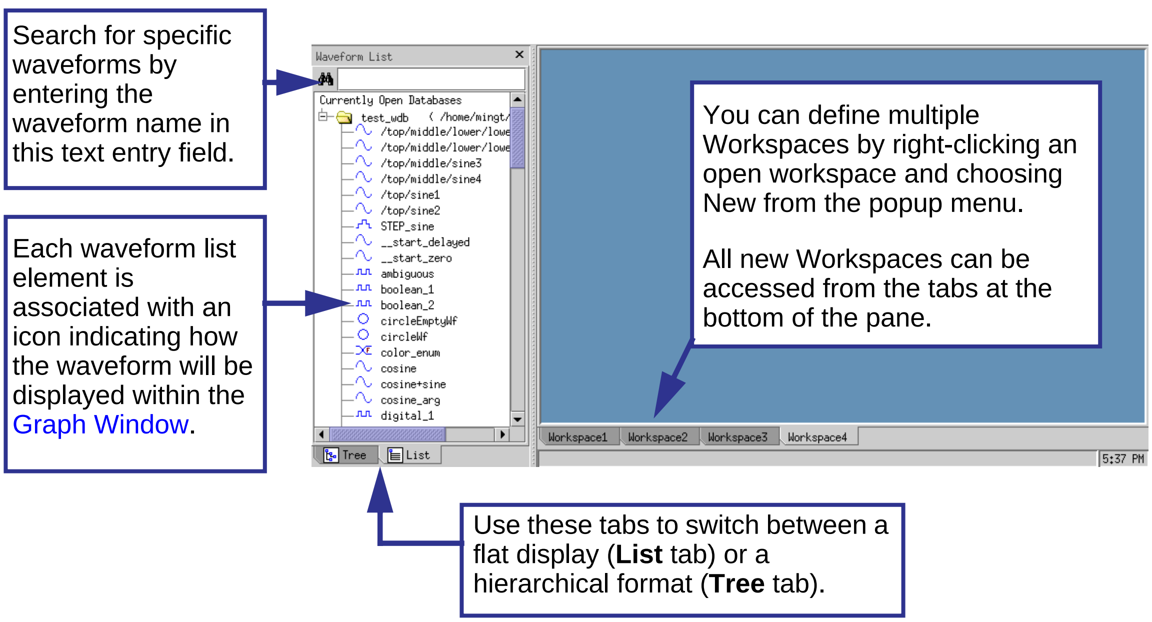
5 **Save Data:** Save your active Graph window data to a Save Window file (.swd) by selecting **File > Save**.

Waveform List Panel and Workspace

The Waveform List Panel resides on the left side of the application window, below the menu bar. The waveform list displays all of the currently open databases as folders with folders or the individual waveforms listed underneath.

The Workspace is the area where the Graph windows are displayed. It is located directly below the toolbar on the application window. You can move, resize, minimize, and restore each Graph window that is displayed on the Workspace. From the **Window** pull-down menu, you can manage the windows in a tiled or cascaded style.

Figure 1-2. Waveform List Panel and Workspace



Graph Window

The Graph window is used to plot and view waveforms. A waveform is a collection of values along a time continuum, frequency, or other domain axis. The axis is referred to as the *domain*, and the values positioned along the axis are the *range*. Waveforms can be dragged up and down within the Graph window or overlaid for comparison display. Minimum and maximum axis values and data scale can be changed easily. Additionally, the viewer supports dual axis display in support of overlaid plots.

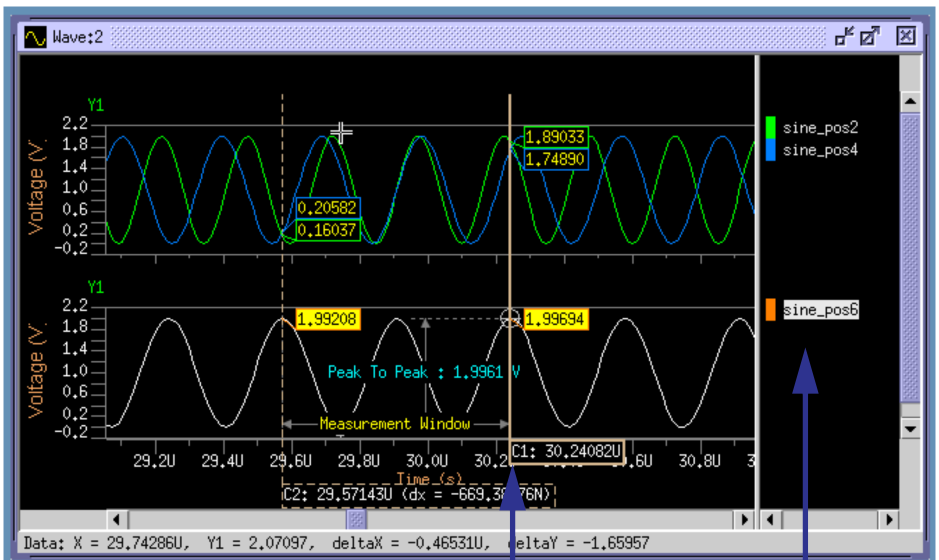
Graph windows appear when you drag waveform icons from the left Waveform List panel into the EZwave Workspace. You can have a single waveform in a Graph window, multiple waveforms overlaid in a Graph window, or multiple rows of waveforms in a single Graph window.

Graph windows can display different types of waveforms. Digital waveforms displayed on a Graph window are called Trace rows. Analog waveforms are displayed in Graph rows. Examples of both are shown in Figure 1-3.

Figure 1-3. Graph Windows

Trace Rows: These are rows that display digital waveforms. Digital waveforms display only logic states (on/off, hi/low, and so on).

Graph Rows: These are rows that display analog waveforms Each point on an analog waveform represents a specifically graphed data point (for instance, showing voltage versus time).



Check here to see the current X Y coordinates of your mouse pointer (analog waveforms can be displayed with dual Y-axes).

If you click on a waveform, it also shows the distance between the point clicked and your previous location (shown as deltaX and deltaY).

Drag your mouse pointer on an axis to zoom in on a waveform. To reverse the action, click the Undo Zoom button on the main toolbar.

You can then add Cursors to measure points or lengths of a waveform.

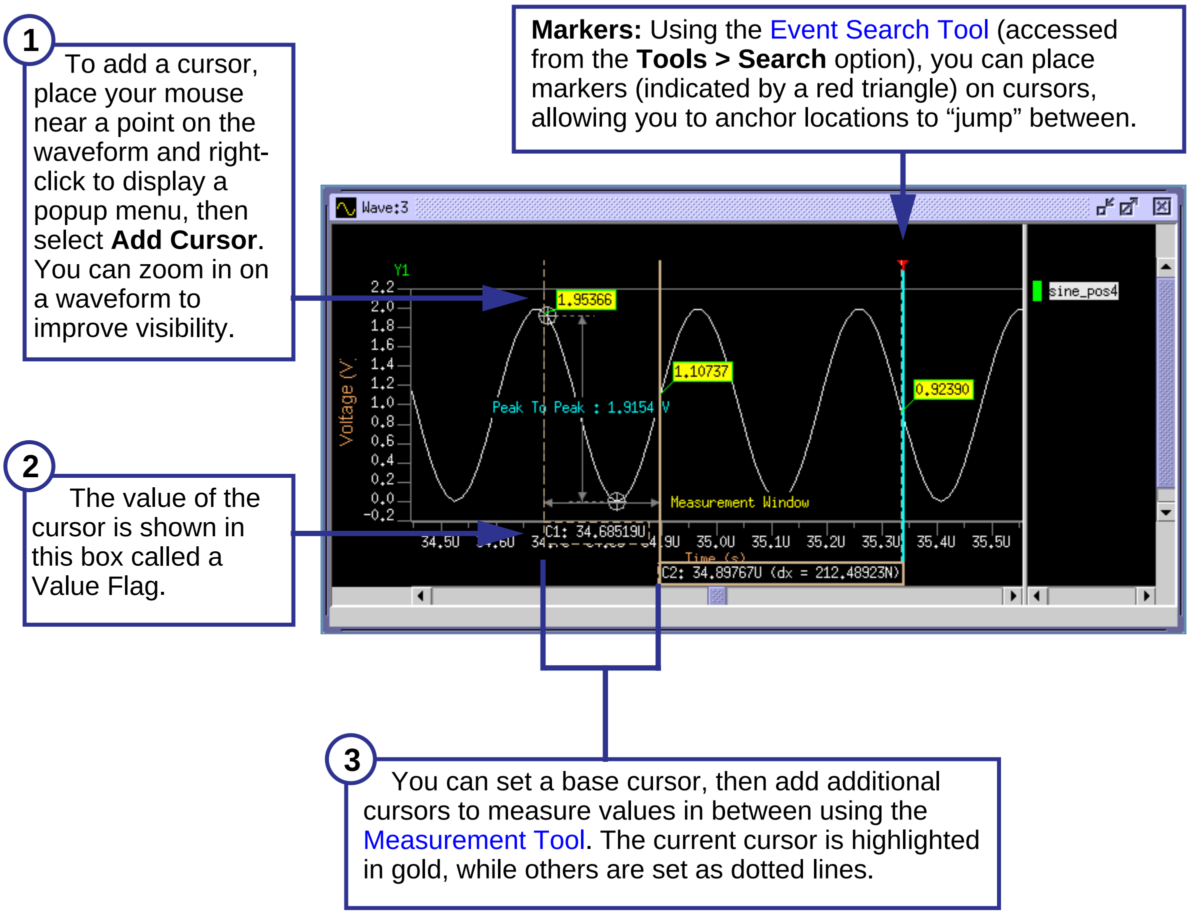
Individual waveform names are listed in this right pane.

Use **Format > Waveform Names** to control how much information is shown.

Cursors

A cursor is a special on-screen indicator, such as a vertical line, drawn in the Graph window waveform display area to identify locations or create a point for measurement. The first cursor created is known as the base (reference) cursor. Multiple cursors can be added to show data points as well as interpolated values between data points and the delta between the base cursor.

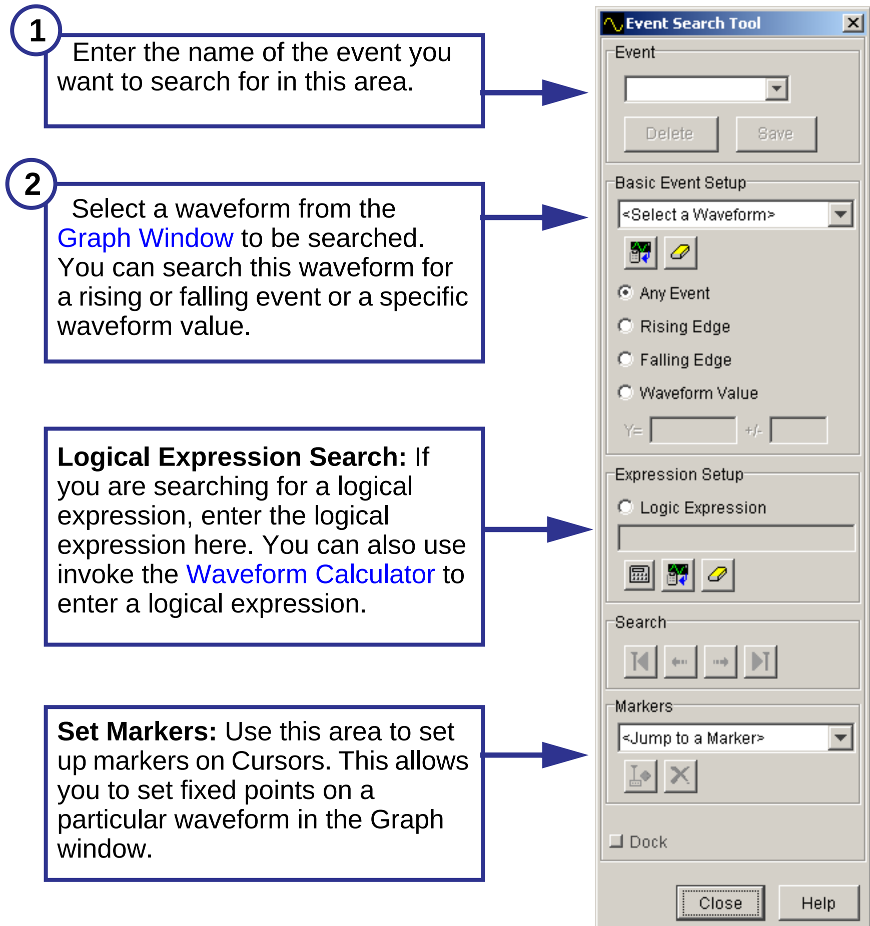
Figure 1-4. Example Cursor



Event Search Tool

Select **Tools** > **Search** to invoke the Event Search Tool. This tool enables you to locate occurrences of simulation events interactively. An event is a definition of specific states (or values) for a single waveform or a collection of waveforms. To define an event, you need to select a set of waveforms and specify the states (or values) you want them to have.

Figure 1-5. Event Search Tool

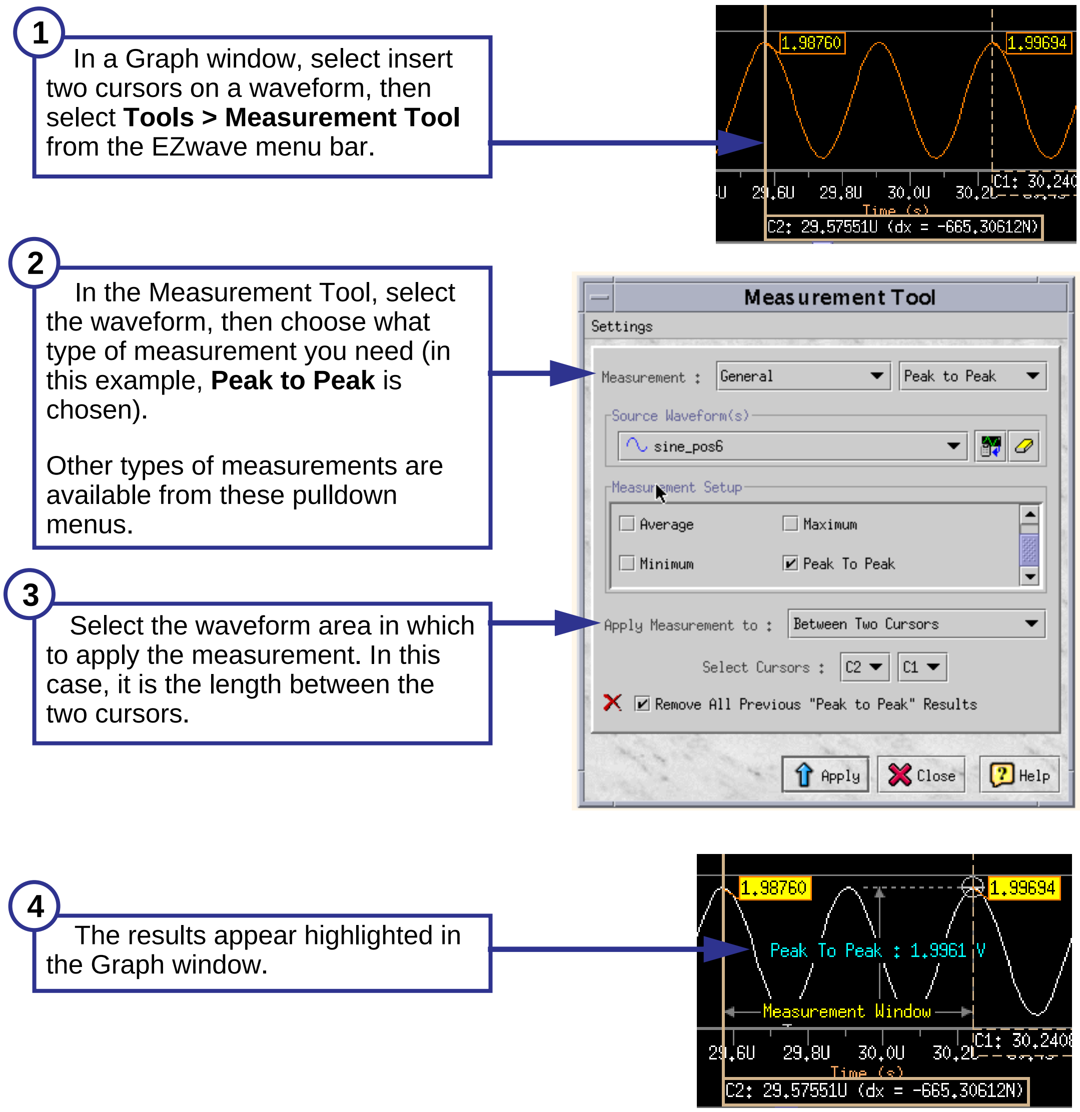


Measurement Tool

Select **Tools** > **Measurement Tool...** to invoke the Measurement Tool. This tool allows you to perform a variety of analog and mixed-signal measurement operations on those waveforms displayed in the Graph window. The results of the measurements can be annotated in the Graph window along with the measured waveforms. You can use the Measurement Tool with analog or digital waveforms, as long as the measurement operation is applicable to the selected waveforms. The measurement operations are divided into categories, such as general, time-domain, frequency-domain, and statistical.

The results of some measurements produce other waveforms. The EZwave Measurement Tool allows you the option of creating and plotting the result waveform in the active Graph window.

Figure 1-6. Measurement Tool



Waveform Calculator

Select **Tools** > **Waveform Calculator...** to invoke the Waveform Calculator. This tool is an integral part of post-processing and viewing the analog, digital, and mixed-signal simulation results. It can optimize the time it takes to analyze large amounts of simulation data. It also supports a number of charting and analysis features that may be required by a wide range of users.

Figure 1-7. Waveform Calculator With Button Interface

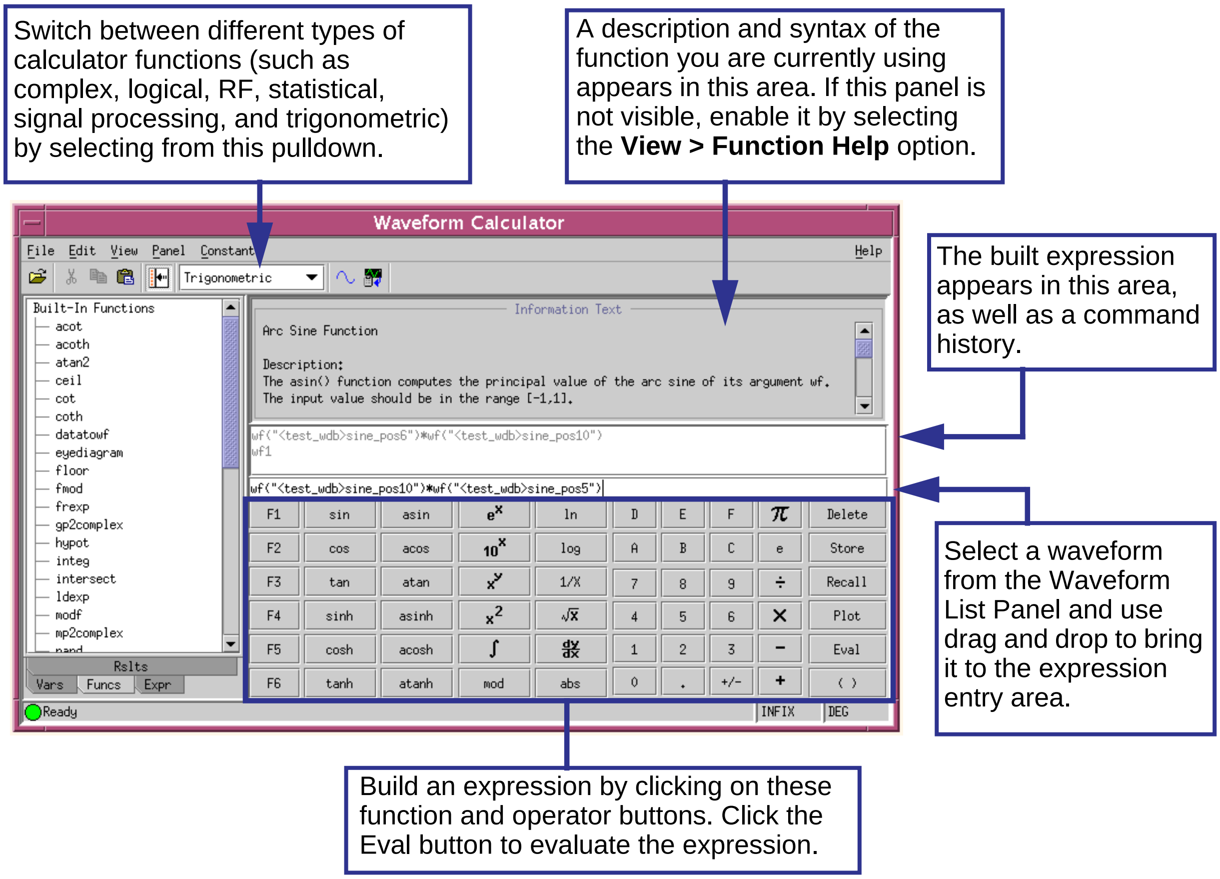
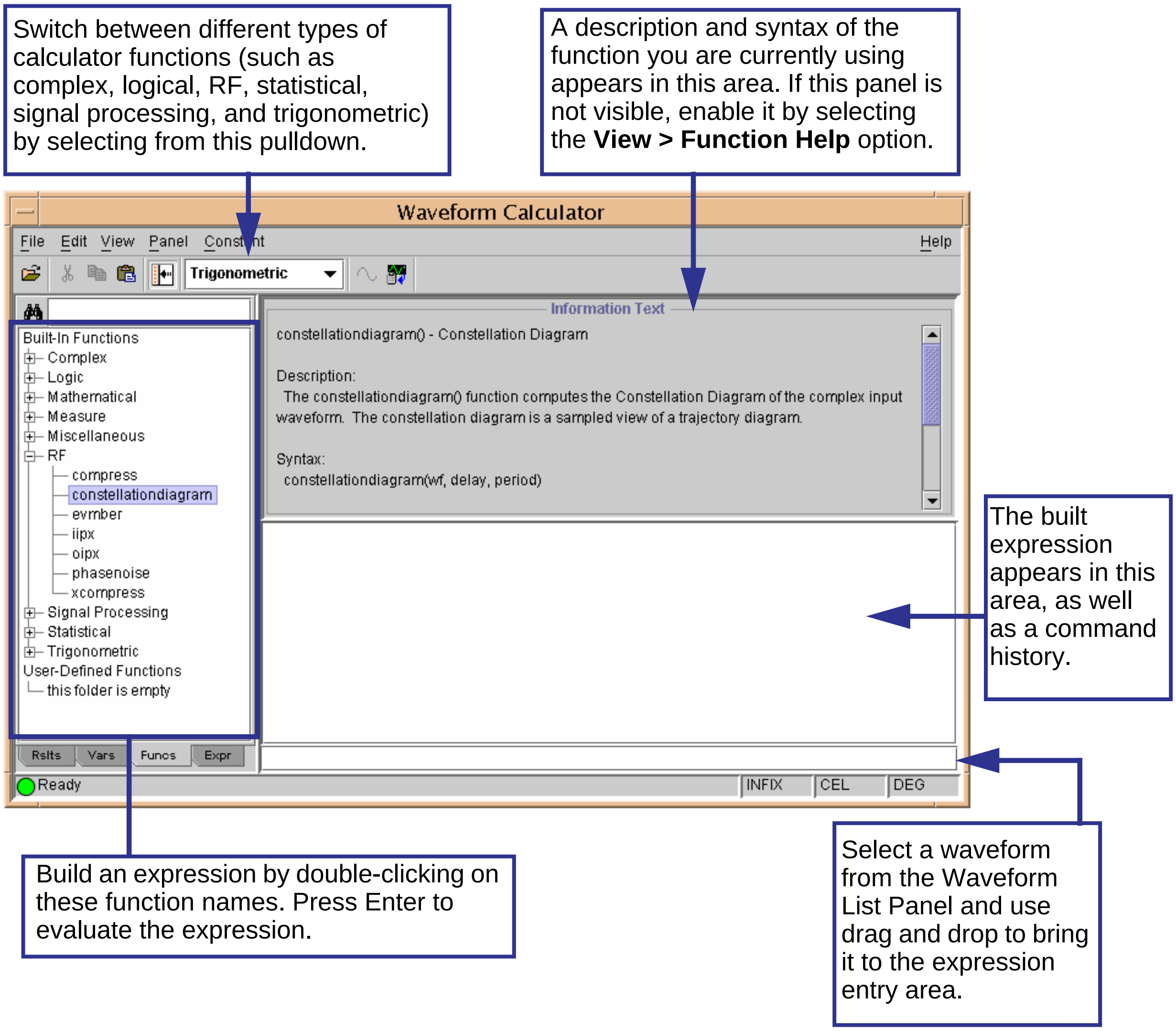


Figure 1-8. Waveform Calculator Without Button Interface



Chapter 2
Using the EZwave Viewer

Figure 2-1. Process Overview

EZwave usage can be organized into five distinct stages:

Stage 1: Set Up and Load Data

Steps to begin using the EZwave program include:

1. Installing the EZwave Application
2. Setting Up Environment Variables
3. Invoking the Application
4. Opening a Database

Chapter 3, "Set Up and Load Data", describes these tasks in detail.

Stage 2: Add Waveforms

Add or select specific waveforms for viewing and analysis. These waveforms can be stacked, overlaid, zoomed, and annotated through the use of keyboard shortcuts, drag-and-drop, mouse clicks and strokes, and menu items. Typical tasks include:

- Adding a Single or Compound Waveform
- Adding Multiple Waveforms
- Temporarily Hiding a Waveform
- Plotting Analog and Digital Waveforms
- Waveform Plotting Rules
- Moving Waveforms

Chapter 4, "Add Waveforms", describes these tasks in detail.

Stage 3: Analysis

Measure, analyze, and annotate datapoints or logic units that are represented in the waveforms. Multiple simulations can be run and the data is saved for additional analysis and reuse. Multiple cursors can be added to show data points as well as interpolated values between data points.

Typical tasks include:

- Adding a Cursor
- Deleting a Cursor
- Selecting a Base Cursor
- Zooming an Area
- Zooming Over an Axis
- Viewing or Selecting Individual Elements Within a Compound Waveform
- Creating Special Charts and Diagrams (such as an XY Plot or Smith Chart)

Chapter 5, "Analysis", describes these tasks in detail.

Stage 4: Post-Process

After analyzing the simulator output data, the EZwave tool provides a number of powerful utilities for processing the data and transforming the raw data to specific characteristic information. Using tools like the Waveform Measurement Tool and the Waveform Calculator, the user can perform sophisticated calculation with a combination of built-in or user-defined arithmetic (such as log, sin, cos) and logical (such as AND, OR, XOR) functions. The calculation results can be waveforms, vectors, or scalar values.

Typical tasks include:

- Forming a Bus
- Transforming Analog Waveform(s) to Digital
- Transforming Digital Waveform(s) to Analog
- Using the Waveform Measurement Tool
- Using the Waveform Calculator

Chapter 6, "Post-Processing", describes these tasks in detail.

Stage 5: Save and Output Data

Save and/or output results to a disk file in either JWDB format or user-defined ASCII format. You can also add text annotations to your waveforms.

Typical tasks include:

- Saving a Waveform Database
- Saving Multiple Databases
- Saving Graph Windows
- Restoring Graph Windows
- Printing a Graph Window
- Exporting a Graph Window to JPEG
- Adding Text Annotations

Chapter 7, "Save and Output Data", describes these tasks in detail.

Chapter 3
Set Up and Load Data

After installation, but before invoking the EZwave application for the first time, you must set several initialization parameters. These parameters provide the application and operating system with information about the file locations, invocation options, and other data necessary for the EZwave application to function optimally. After these parameters are set, the application is invoked with a number of possible options.

After invocation, you can specify which data to load. The EZwave tool accepts data in a large number of formats, including the default Joint Waveform DataBase (JWDB) format.

Installing the EZwave Application

To ensure that the A/MS software is installed correctly, an interactive installation shell script is provided. This shell script allows installation from a CD-ROM or from a download available from the Mentor Graphics support site.

Installation is platform-dependent (for example, Solaris software should be installed from a Solaris workstation with the supported OS, and so on).

For more information on A/MS installation, please see the *Analog/Mixed-Signal Installation Guide*.

Setting Up Environment Variables

During the installation process, several key environment variables were set to default path locations. Verify that the following environment variables were set to their correct locations.

For Windows hosts, check the **Control Panel** > **System** > **Advanced** tab > **Environment Variables** button.

For UNIX hosts, use the following command in a command shell:

```
echo $environment_variable
```

Table 3-1. EZwave Environment Variables

Environment Variable	Description
LM_LICENSE_FILE	Points to your Mentor Graphics license file or license server.
anacad	Points to the root installation tree.

Invoking the Application

When invoking the EZwave application, you may simply type *"ezwave"* at the Unix or Linux prompt:

```
$> ezwave [options] [file1 ...]
```

The EZwave application supports a set of command options. Table 3-2 lists the supported options.

Table 3-2. EZwave Command Options

Option	Description
-location *x# y#*	Sets the location of the initial window
-height #	Sets the default height of the application windows
-width #	Sets the default width of the application windows
-logfile *path*	Specifies the location for the session log file
-nologging	Prevents session activity from being logged to a file
-norestore	Prevents settings from a previous session from being restored
-nosplash	Prevents splash screen from opening (MUST be the first argument)
-nowindow	Prevents opening the initial empty window
-maxwnd	Sets the initial window to be maximized
-help | -usage	Displays this help text
-do *file*.tcl	Indicates Tcl filename and location to be executed by the EZwave application.

Invoking the Application from Other Host Applications

The EZwave application can be invoked from other host applications such as a simulator (for example, ADvance MS), a schematic capture tool (for example, Design Architect®-IC), or another design environment tool. For information on how to invoke the application from these documents, refer to the documentation provided with these host applications.

Opening a Database

A database must be loaded within the EZwave viewer before plotting. A variety of different database types are supported by the application. To open a database for use:

1. Select the **Open** item from the **File** menu or click the **Open** toolbar button. The Open dialog box appears.
2. In the Open dialog box, use the dropdown list on **Files of type:** to select a filter if desired. The MGC Database Files filter helps you in selecting waveform database files (identified with the **.wdb** extension).

   The file types listed in Table 3-3 are supported:

   Table 3-3. File Types

File Type	Extension
MGC Database (JWDB) Files	.wdb (default)
COU Files	.cou
HSPICE Graph Data Files	.tr%, .ac%, .sw%
VCD (Value Change Dump) Files	.vcd
CSV (Comma Separated Vector) Files	.csv
Saved Windows Files	.swd
Tcl Files	.tcl

3. Select your file from the list. The application now shows your selected database in the Waveform List panel. You may open multiple waveform databases in the Waveform List panel at the same time.

   All formats except the default MGC Database (JWDB) are loaded to the EZwave viewer through translation.

Chapter 4
Add Waveforms

This chapter describes waveform operations. A complete description of all waveform-related tasks can be found in the EZwave online help.

Adding a Single or Compound Waveform

The *X-axis domain (*also known as *waveform type*) of a waveform can be one of time-domain, frequency-domain, parametric, and so forth. The X-axis domain can affect where a single waveform is plotted, because waveforms with incompatible X-axis domains cannot appear in the same Graph window together.

To add a single or compound waveform (compound waveforms are identified by a plus sign over the waveform icon) to the Graph window, use the following steps:

1. In the Waveform List panel, locate the waveform you wish to see. Expand the database if needed.
2. Use one of the following methods to make the waveform appear:
    - Drag the waveform name to:
        - An active Graph window with a compatible X-axis domain

          The waveform appears in that Graph window. The location in the Graph window where you drag the waveform affects where it is plotted. Dragging it into an existing row plots it overlaid with the waveforms in that row; otherwise, a new row is created where you dropped the waveform.

          If you drag to a Graph window with an incompatible X-axis domain, an error occurs.
        - The workspace

          The waveform appears in a new Graph window.

- Double-click the waveform name.

  If an active Graph window is open and the X-axis domain is compatible with the selected waveform(s), the waveform appears. Otherwise, a new Graph window opens and the waveform is added to it.

- Use the popup menu.

  Right-click the waveform name and select the **Plot** item. More details about this method are given in the following section.

Adding Multiple Waveforms

You can also add several waveforms at once to the Graph window using the **CTRL** + Click method. To do this, use the following steps:

1. In the waveform list panel, locate the waveforms you wish to see. Expand the database if needed.
2. Press the **CTRL** key and click each waveform name desired. (You can also press the **SHIFT** key and click the first and last waveform names in a continuous list. All the selected waveform names will highlight.)
3. Drag the waveform names to an active Graph window or the workspace, as described in the previous section.

   Any analog waveforms selected are plotted overlaid. Digital waveforms are plotted stacked.

If you want more plotting options, you can perform the following two steps instead of dragging the waveforms to the workspace area:

3. Right-click to display the popup menu.
4. From the popup menu, select **Plot (overlaid)**, **Plot (stacked)**, or **Plot as Bus**. If an active Graph window is open, the newly added waveforms are added in new row(s) at the bottom of the Graph window. Otherwise, a new Graph window will open and the waveforms will be added to it.

   The **Plot (overlaid)** option is dimmed if you have selected only multiple digital waveforms.

   If you select **Plot as Bus**, you can plot multiple analog waveforms with or without digital waveforms as a bus. All analog waveforms are initially converted to digital waveforms, then plotted as a bus.

   For further details of forming a bus and analog to digital waveform conversion, refer to the sections “Forming a Bus” and “Transforming Analog Waveform(s) to Digital” in Chapter 6, “Post-Processing”.

Note

When selecting multiple waveforms, you must observe the waveform plotting rules listed in the section "Waveform Plotting Rules" in this chapter.

Temporarily Hiding a Waveform

When you need to hide a waveform from the display to view other data:

1. Select the waveform in the active Graph window and right-click to display the popup menu.
2. Select **Hide Waveform** from the popup menu.

The waveform label appears in the active Graph window but the waveform itself does not appear. This action differs from **Delete** as the waveform is still within the Graph window and available for later viewing. The label will still display, but will appear dimmed, indicating the *hide* condition.

To restore the waveform to the active Graph window:

1. Right-click the label for the waveform. The popup menu will have a check next to **Hide Waveform**.
2. Click this box to remove the check. The waveform will now display in the row of the active Graph window.

Moving Waveforms

To move a waveform within the active Graph window, perform the following steps:

1. Select the waveform label in the active Graph window.
2. With the mouse button still engaged, drag the waveform to the new row. Release the mouse button when it is at the desired location.

The waveform displays in the row you selected. If you want the waveform to be displayed in a new row, drag the waveform below the last row above the first row or between two rows, and release the mouse button. A new row appears with the waveform contained within it.

Plotting Analog and Digital Waveforms

When you plot analog and digital waveforms, the order of selection of the waveforms will dictate whether the plotted waveforms appear together within a single row (called "overlaid") or within new rows (called "stacked").

Waveform Plotting Rules

Remember the following rules for plotting waveforms:

1. Digital waveforms may not be plotted over other digital waveforms (overlaid), except when plotted as a bus.
2. When selecting multiple (analog and digital) waveforms from the Waveform List panel for plotting overlaid (from the popup menu), an analog waveform must be selected first in the multiple selection if you want both analog and digital waveforms plotted in the same row.

   Otherwise, the plotting occurs based on the order of the selection.

   Selecting a digital waveform first will result in all digital waveforms plotted in separate rows until an analog waveform is reached. Subsequent waveforms in the selection list (digital and analog) will plot overlaid on that waveform.
3. When selecting multiple (analog and digital) waveforms from the Waveform List panel for drag and drop plotting, the viewer will plot all digital waveforms in separate rows and all analog waveforms overlaid in a single row regardless of the order of selection. If you do not want this default behavior, use the popup menu to specify plotting overlaid or stacked (see Rule 2 for selection order).
4. When using the drag and drop method to plot or move waveforms, you can drag one or more digital waveforms into an existing analog row. Drag waveforms into an existing digital row to create new rows for those waveforms.
5. When selecting multiple (analog and digital) waveforms and plotting as a bus, the viewer first converts analog waveforms to digital and then forms a bus according to the order of selection. For more details on how to modify the baseline, topline, and threshold values used for analog to digital conversion, refer to "Transforming Analog Waveform(s) to Digital" in Chapter 6, "Post-Processing".

Drag a waveform into an existing row to plot the waveform in that row. This is called an overlaid plot. Digital waveforms will not accept overlaid plots.

Chapter 5
Analysis

After selecting the desired waveforms, you can measure, analyze, and annotate datapoints or logic units that are represented in the waveforms. Multiple simulations can be run and the data is saved for additional analysis and reuse.

Using Cursors

Place cursors over the waveforms to take measurements and capture values to use in other measurements.

Adding a Cursor

To add a single cursor to a waveform in the Graph window:

1. Select **Cursor > Add** from the pull-down menu or click on the **Add Cursor** button from the toolbar menu. A cursor will appear at the left side of the active Graph window.
2. Click the cursor and drag it to the desired location.

To add a cursor in a specific location:

1. Place your mouse pointer on or near the desired location and right-click the mouse button.
2. From the popup menu, select the **Add Cursor** menu item.

You can add multiple cursors by repeating steps 1 and 2, using either method, for each additional cursor. When you add a new cursor, it becomes the active cursor. The first cursor is labeled **C1**; subsequent cursors are labeled **C*x***, where ***x*** is the lowest number not currently assigned to a cursor.

Deleting a Cursor

To delete a single cursor from a waveform in the Graph window:

1. In the Graph window, locate the cursor you wish to delete.
2. Place your mouse pointer on desired cursor and left-click the mouse button to select the cursor as the active cursor. Select the **Delete Active Cursor** button from the toolbar menu. The cursor will be deleted.

Alternatively:

1. Place your mouse pointer on the desired location and right-click the mouse button.
2. From the popup menu, select the **Delete Active** menu item.

Selecting a Base Cursor

When multiple cursors are displayed in the Graph window, by default, the first cursor becomes the base cursor. The base cursor is used as a reference for various measurements. The X value and the delta-X are shown for each cursor. The X value is the current value, and the delta-X value is the difference between the current X value and the base cursor.

To identify the base cursor, look at the information box shown at the bottom of the cursors. The box for the base cursor is flush with the X-axis and does not contain a delta-X value. The box for the other cursors is shown lower beneath the unit labeling for the X-axis and contains a delta-X value.

To select a cursor to act as the base cursor or reference cursor, use the following steps:

1. Place your mouse pointer on desired cursor and right-click the mouse button.
2. From the popup menu, select the **"Base" Cursor** menu item. This cursor now becomes the base cursor. Once this section is made, all delta-X measurements are updated to reflect this base cursor.

Only one base cursor is permitted in any Graph window. By selecting a new base cursor, the previous base cursor immediately reverts to a regular cursor.

Moving Cursors

To move a cursor, left-click it and drag it to the desired location. The X value (and delta-X value, if appropriate) in the information box at the bottom of the cursor and the Y value at the intercept point of the cursor and the waveform update as you drag the cursor.

If you want to move a cursor to a specific X-value:

1. Right-click the desired cursor and select **Move To...** from the popup menu.

   The Move Cursor dialog box appears.

2. Clear the value in the dialog box.

3. Enter the new value and use the pull-down menu to select units for the new value, if necessary.

4. Click **OK**.

The cursor will move to the selected X-value.

Locking Cursors When Moving

If you want all of your cursors to move together, select **Cursor > Lock Together When Dragging**. When you move any cursor, whether by dragging it or by using the Move Cursor dialog box, all of the cursors will move the same distance.

Hiding and Displaying Information

To hide the value flag (the box on the cursor displaying the waveform value at the intercept), right-click the value flag and select **Hide Value** from the popup menu.

If a cursor crosses multiple waveforms, you can hide all of the value flags at once by right-clicking the cursor and selecting **Data Values > Hide All** from the popup menu.

To restore the value flag(s) associated with a cursor, right-click the cursor and select **Data Values > Show All** from the popup menu.

Associate Y-level lines with a cursor by right-clicking the value flag and selecting **Y-Level Line** from the popup menu.

Using Cursor Values

To use the value of a waveform at the cursor in other measurements, right-click the value flag and select **Copy Value to Clipboard** from the popup menu. The value will be copied onto the clipboard and be available to be pasted into dialog boxes.

Zooming

Area zooming is useful to close in on an area to get more detailed visual references.

Zooming an Area

With an area zoom, you use the mouse pointer to draw a rectangle around the area for the zoom. Perform the following steps:

1. Starting in the upper left corner, identify the start of the area you wish to zoom.
2. Holding the left mouse button and drag the mouse from the upper left to the lower right corner of the area (in a diagonal fashion).
3. A white box displays around the area. Release the mouse button. The display changes to the appropriate zoom factor.

A history of zoom changes is kept in the system, allowing you to easily undo prior zoom magnification changes. To undo a zoom change, click the **Undo Most Recent Zoom** button on the toolbar. You can also undo a zoom change by clicking the **Undo Previous Action** button on the toolbar, if no other graphical changes (such as moving a cursor) have occurred since the zoom.

Zooming Over an Axis

To use the mouse pointer for a fast zoom, perform the following steps:

1. Place the mouse pointer over one of the values of the X axis (or Y axis).
2. Holding the left mouse button down, drag the mouse pointer to the right a short distance on the X axis (or Y axis).
3. Repeat the action until the display is at the desired magnification.

A history of zoom changes is kept in the system, allowing you to easily undo prior zoom magnification changes. To undo a zoom change, click the **Undo Zoom** toolbar button.

Viewing or Selecting Individual Elements Within a Compound Waveform

You can view or select one or more individual elements within a compound waveform. To do this, use the following steps:

1. Do an area zoom around the area of interest until you can see the individual elements of the waveform.
2. Left-click on the element of interest.
3. To select more than one element, hold down the **CTRL** key on the keyboard and click each element name desired. All the selected elements will be highlighted
4. To select all elements, right-click on the waveform name.

5. Right-click to display a popup menu for the element(s).

Moving the cursor over an individual element will display information about that particular element.

Creating Special Charts and Diagrams

Creating an XY Plot

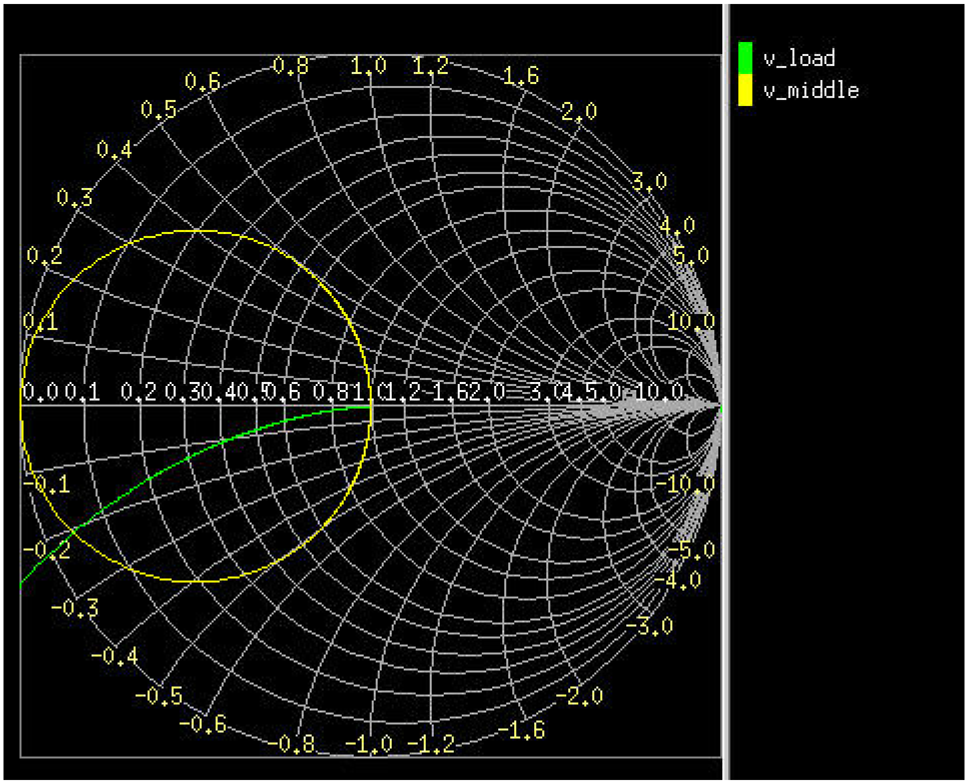
The EZwave viewer allows you plot a waveform as a function of another waveform. To create such a waveform in an XY plot, complete the following:

1. Plot the desired waveforms on the same graph row.
2. Right-click the waveform you want to be the X-axis.
3. From the popup menu, select **Set as X Axis**. The resulting XY plot waveform displays in a new Graph window.
4. You can right-click the waveform and select **Add Cursor** from the popup menu to place a point cursor to see exact values and analyze the resulting signal.

Creating a Smith Chart

The EZwave viewer allows you to generate a Smith chart (both impedance and admittance grids) and a polar chart. Typically, scattering parameter (also known as the S-parameter) waveforms are plotted by default in the Smith and polar charts.

Figure 5-1. Smith Chart (Admittance View)



Displaying a Scatter Parameter (S-Parameter) Waveform

To display an S-parameter waveform in the Smith chart, perform the following steps:

1. In the Waveform List panel, locate the S11- or S22-parameter waveform you wish to view.
2. Double-click the waveform name or right-click on the waveform. From the popup menu, select the **Plot** menu item. If an active Graph window is not opened or is opened with other XY plot for time-domain, frequency-domain and parametric signal display, a new Graph window opens with Smith/polar coordinates and the waveform will be added to it. Otherwise, the S-parameter waveform appears in the existing Smith/polar chart.

To invoke a Smith chart from a displayed complex-valued frequency-domain waveform, click the displayed waveform and select **Transformations** > **smith_chart** from the pop-up menu.

The Smith chart ordinarily displays only positive real values. However, if values of S11- or S22-parameter waveforms extend beyond the reaches of the display, the Smith chart is automatically extended to show values outside this range. The maximum negative real values are:

- -0.8 for the left part of the chart
- -1.2 for the right part of the chart

The maximum imaginary values are:

- 0.2 for the top part of the chart
- -0.2 for the bottom part of the chart

Switching Between Impedance and Admittance Display

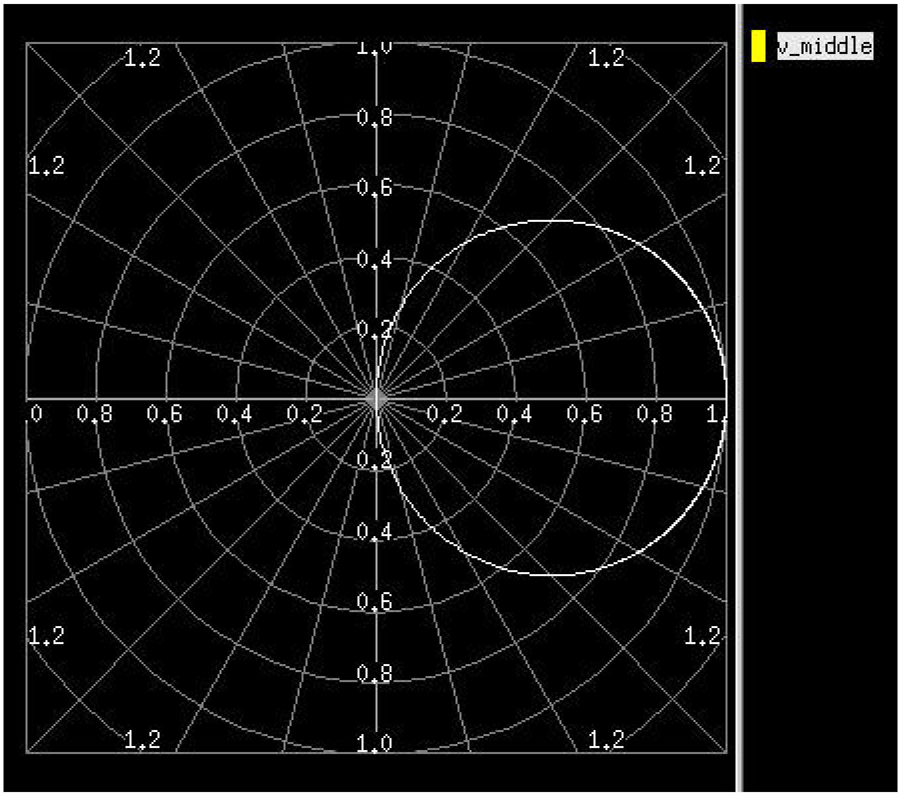
You can change the display to switch between impedance (also known as Z-parameter) and admittance (also known as Y-parameter) coordinates. To change between impedance and admittance displays:

1. Right-click the waveform row containing the Smith chart.
2. Select either **Smith Chart** > **Impedance** or **Smith Chart** > **Admittance**.

Switching Between Smith Chart and Polar Chart

You can also switch between a Smith chart and a polar chart display for the same waveform. To change the display, right-click to invoke a pop-up menu and select **Transformations** > **polar_chart**. (See Figure 5-2.)

Figure 5-2. Polar Chart

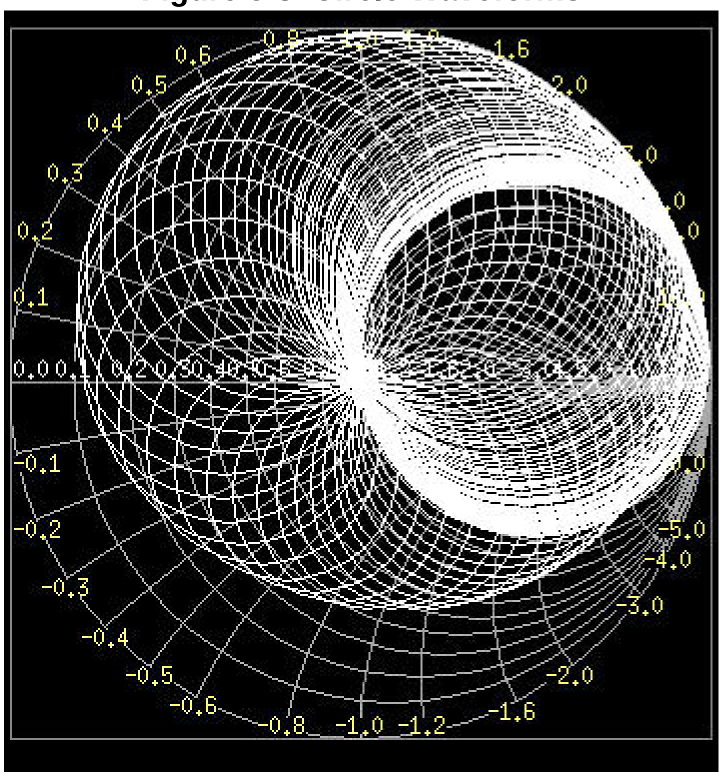


Plotting Circle Waveforms

Constant circles (for example, Gain Available Circles, Gain Power Circles), Stability circles (for example, Source Stability Circle, Load Stability Circle) and Noise circles associated with specific frequencies can also be displayed in the Smith chart. To display circle waveforms, perform the following steps.

1. In the Waveform List panel, locate the circle waveform you wish to view.
2. Double-click the waveform name or right-click the waveform. From the popup menu, select the **Plot** menu item.

Figure 5-3. Circle Waveforms



Setting Circle Waveform Visibility

Typically, a circle waveform contains a family of circles and each circle corresponds to a particular frequency between a frequency band. Use the Circle Visibility dialog box to select which circles you want to keep visible in the plot. To set circle waveform visibility:

1. Right-click on the waveform label in the active Graph window to pop up the Circle Visibility dialog box.
2. Select the circle that you want to display. To select more than one circle, use the **SHIFT** key or **CTRL** key while clicking on additional circles.

Chapter 6
Post-Processing

After analyzing the simulator output data, the EZwave tool provides a number of powerful utilities for processing the data and transforming the raw data to specific characteristic information. Using tools like the Waveform Measurement Tool and the Waveform Calculator, you can perform sophisticated calculation with a combination of built-in or user-defined arithmetic (such as log, sin, cos) and logical (such as AND, OR, XOR) functions.

Forming a Bus

The EZwave viewer allows you to form your own bus from selected waveforms (also known as bits). The viewer accepts both analog and digital waveforms and any hybrid combination of analog and digital waveforms as input bit waveforms.

To create a bus:

1. Select the bits that you want to group, either from the active Graph window or from the Waveform List panel. You can select multiple bits by holding the **CTRL** key while clicking on the waveforms or waveform labels.
2. Select **Tools** > **Create Bus** to open the Create Bus dialog box. The dialog box shows the default name of the bus and the content of the bus.
3. Name the bus by clicking in the **Name** text window of the Bus Options field and entering the desired bus name.
4. Use the **Radix** pull-down menu to select **Two's Complement**, **Binary**, **Hexadecimal**, **Octal**, or **Unsigned Decimal**.
5. The Bits in Bus pane lists all of the selected waveform names. The waveform first selected is used as the Most Significant Bit (MSB) of the bus, and the waveform selected last is used as the Least Significant Bit (LSB).

   If some or all of the input bit waveforms are analog, you will be prompted in the lower portion of dialog box to set up analog-to-digital conversion criteria. Analog-to-digital conversion will be performed prior to bus creation within a single operation. The results of the analog-to-digital conversion appear in the *calc* database.

6. Click **OK** to create and plot the new bus.

The bus can be modified by moving the bits (which can affect the MSB and LSB), inverting the bits, and/or adding extra bits to the bus.

To add bits to the bus:

1. Click **Add** to pop up the Add Bits to Bus dialog box.
2. The Add Bits to Bus dialog box lists all of the digital waveforms in the database not already included in the bus. Select one or multiple waveforms and click **OK** to add these to the bus.

Click **Invert** to invert the order of the bits in the bus.

Select one or more waveforms in the Bits in Bus pane and click **Move Up** or **Move Down** to move these bit(s) one bit upward or downward, respectively.

Transforming Analog Waveform(s) to Digital

When you need to take an analog waveform and create a digital waveform:

1. Select the waveform in the active Graph window and right-click to display the popup menu.
2. Select **Analog to Digital** from the popup menu, and the Analog to Digital Conversion dialog appears.
3. Name the new waveform by clicking in the **Name** text box in the Digitized Waveform(s) field and changing the default to a desired waveform name.
4. To plot the digitized waveform in a **Stacked** new graph row or **Overlaid** with the original waveform, make you selection by checking one of the circles in the Plot Option.
5. If you do not want to plot the digitized waveform to the active Graph window, uncheck the **Plot Result Waveform(s)** box.
6. Use **Single Threshold** or **Two Thresholds** to digitize the input waveform. Fill in the text box(es) of the Transformation Setup field with the desired threshold values.
7. Click **OK** to perform the transformation, or click **Cancel** to abort and close the dialog.

Transforming Digital Waveform(s) to Analog

When you need to take a digital bus or bit and create an analog waveform:

1. Select the bus or bit in the active Graph window and right-click to display the popup menu.
2. Select **Digital to Analog** from the popup menu. The Digital to Analog Conversion dialog box appears.
3. In the **Name** text box, change the default name to a desired waveform name.
4. Specify to plot the resulting waveform in a **Stacked** new graph row or **Overlaid** with the original waveform.
5. Uncheck the **Plot Result Waveform(s)** box if you do not want to plot the resulting waveform in the active Graph window.

- For a bus:
    a. Specify the **Value** by entering an addition value and then the multiplication value. If the bus value is one of the standard logic states, then the analog value is the same as the previous analog value, or 0.0 in the case of initial value.
    b. Select to either **Do Not Interpolate** or **Interpolate**.

       If you select **Do Not Interpolate**, specify if you want to **Use Commutation Time** and enter the desired time. This is the time necessary to switch from the previous bus value to the new bus value.
- For a bit:
    a. Enter an analog value for each digital value, or use the supplied default.
    b. Under **Commutation Time Values**, enter the rise time (time necessary to go from ’0’ to ’1’) and the fall time (time necessary to go from ’1’ to ’0’).

6. Click **OK** to perform the transformation, or click **Cancel** to abort and close the dialog.

Using the Waveform Measurement Tool

Use the **Tools** > **Measurement Tool** menu item to open the Measurement Tool window.

The Measurement Tool can be used to measure the values of a waveform shown in Table 6-1.

Table 6-1. Measurement Tool Values

Frequency Domain	General	Statistical	Time Domain
Bandpass	Average	Maximum	Delay
Gain Margin	Crossing	Mean	Duty Cycle
Phase Margin	Intersect	Mean +3 Std Dev	Falltime
	Local Maximum	Mean -3 Std Dev	Frequency
	Local Minimum	Minimum	Overshoot
	Maximum	RMS	Period
	Minimum	Standard Deviation	Pulse Width
	Peak to Peak		Risetime
	Slope		Settle Time
	Slope Intersect		Slew Rate
			Undershoot

Selecting a Waveform

1. Select a waveform or waveform label in the active Graph window. To select more than one waveform, use the **CTRL** key while clicking on additional waveforms.
2. Click the **Add Selected Waveforms** button (immediately to the right of the <**Select a Waveform**> pulldown menu in the **Source Waveform(s)** field) to add the selected waveform to the **Source Waveform** field.

Setting Up Measurement Criteria

The layout of the **Measurement Setup** field changes based on the type of measurement you have selected. Some measurement types have no options defined; others may use check boxes, pull-down menus, text fields, and buttons.

Some statistical and general measurements will include the notation **Select One Or More Measurements** in the **Measurement Setup** field. Every measurement selected will be displayed when you click **Apply**.

Setting Up Measurement Result Presentation

To present multiple measurement results, check either **Annotate Waveform(s) with Result Marker(s)** or **Plot New Waveform**. If **Plot New Waveform** is selected a new Graph window will open if necessary (if the new X-axis is incompatible with the existing X-axis). Not all measurements will offer this selection.

Note

If you are measuring a compound waveform, you have several extra options when you use the Plot New Waveform option. A pulldown menu appears for both X and Y selections (if available). The X-axis pulldown options will change depending on the measurement type (such as Average or Bandpass). For the Y-axis, you can choose between C1 (a parameter that the simulations were swept based upon), index, or time, depending on the measurement type.

Applying Measurement

Use the **Apply Measurement To:** pulldown menu to choose to apply the measurement to:

- The entire waveform
- The currently visible X region only
- The area between two cursors

  If you select this option, two additional pulldown menus appear and allow you to select cursors by name. In addition, the measurement results do not change if you move the cursors once the values have been calculated.

Additionally, you can select to have all previous measurement results removed when the new measurement is displayed.

Click **Apply** to perform the measurement. Clicking **Apply** does not close the measurement tool. Clicking **Close** closes the measurement tool without performing the measurement.

Using the Waveform Calculator

The Waveform Calculator enables you to post-process waveforms for advanced analyses or debugging. To use the calculator:

1. Open the Waveform Calculator application window with the calculator button from the toolbar or use **Tools** > **Waveform Calculator** menu item.
2. Add entries to the **Expression Entry Area** of the calculator by:
   - Choosing waveform names using the **Add Selected Waveforms** button

- Using Buttons
- Using Built-in Functions
- Using User-Defined Functions
- Using Measurement Tool Functions Within the Waveform Calculator

These methods are described in the following sections.

3. Once you have the desired entries, click the **Eval** button. The results display in the Rslts tab of the Chooser Panel.
4. If the results include a waveform, click the plot button to plot the resulting waveform in the waveform viewer display. You need to save any resulting waveforms.
5. If you want to store an expression for later use, click the **Store** button. Assign the expression to a variable. This variable is accessible from the Vars tab of the Chooser Panel.

Using Buttons

1. Open the Waveform Calculator.
2. Select the category. The categories include:

• Complex	• Logic	• RF
• Signal Processing	• Statistical	• Trigonometric

There are a variety of methods that can be used to form expressions with the buttons. Two of those are the right-click method and the drag and drop method

Right-click Method

1. Click on a function button to add the function to the Expression Entry Area.
2. Select the waveform or waveform label in the active Graph window.
3. Right-click to display Waveform popup menu. From the Waveform popup menu, select **Copy**.
4. Place the cursor in between the parentheses of the function in the Expression Entry Area.
5. Right-click in the entry area to display the popup menu, and select **Paste** from the popup menu to add the waveform name in between the parentheses of the function.

Drag and Drop Method

1. Click on a function button to add the function to the Expression Entry Area.

2. Select the waveform label in the active Graph window.
3. Hold the left mouse button down, drag the label to the Expression Entry Area of the calculator, and release the mouse button.

Using Built-in Functions

There are several categories of built-in functions available:

- Complex
- Logic
- Mathematical
- Measure
- Miscellaneous
- RF
- Signal Processing
- Statistical
- Trigonometric

To access these functions:

1. Open the Waveform Calculator.
2. Select the **Funcs** tab to display the Functions Chooser tab.
3. Expand the function categories by clicking the plus sign (+) next to them.

   The plus sign becomes a minus sign (-) and the functions in that category are listed. Click the minus sign to collapse the category again.
4. Locate functions in the Built-In Functions list by dragging the scroll bar.
5. Double-click a function name, or use drag and drop, to add it to the Expression Entry Area.

Once you have added a function to the Expression Entry area, you can add waveforms, as described previously in the "Using Buttons" section.

Using User-Defined Functions

The Waveform Calculator allows you to open and display functions you have written in Tcl scripts. The waveform calculator then lists these functions under **User-Defined Functions** in the Funcs tab of the chooser panel. To open and use a user-defined function, complete the following:

1. In the Waveform Calculator, select **File > Open Custom File Function**. A browser window displays.
2. Select the desired Tcl file. The waveform calculator lists the function under **User-Defined Functions** in the Funcs tab.
3. Use your user-defined function in the same manner as a built-in function.

Using Measurement Tool Functions Within the Waveform Calculator

You can use the same functions available from the Measurement Tool to evaluate waveforms in the Waveform Calculator or in a Tcl script file.

Using the risetime measurement as an example:

```
risetime(wf, topline = "Automatic", baseline = "Automatic", low = "10%",
mid = "50%", up = "90%", x_start = "Begin", x_end = "End", option = "WF" )
```

Note

All of the parameters can be selected with an associated text entry, pull-down list, check box, or radio button in the Measurement dialog box.

Enter a Measurement Tool function in the expression entry area or script file using one of the following methods:

- `risetime(wf("<tutorial/Time-Domain_Results>v_middle"))`

  If only the waveform name is specified in the function, the application uses all the default parameters.

- `risetime(wf("<tutorial/Time-Domain_Results>v_middle"), baseline=0, topline=5.0)`

  All the default parameters will be used except those that are specified by "*parameter_name*=*value*". The parameters can be in any order, and the reference levels can be either percentages or values.

- `risetime(wf("<tutorial/Time-Domain_Results>v_middle"), "Automatic", 0, 10%, 50%, 90%, "Begin", "End" , "WF")`

  A complete list of parameter values are specified. Without the parameter name specified, all the parameters must be in the right sequence.

You can use any of the following measurement tool functions:

Table 6-2. Measurement Tool Functions

Function	Syntax
average	avg(wf, x_start = "Begin", x_end = "End", option = "Value")
bandpass	bandpass(wf, topline = "Automatic", offset = -3, x_start = "Begin", x_end = "End", option = "Value")
crossing	crossing(wf, ylevel = "Automatic" , slopetrigger = "Either", x_start = "Begin", x_end = "End", option = "WF")

Table 6-2. Measurement Tool Functions (cont.)

Function	Syntax
delay	delay(wf1, wf2, topline1 = "Automatic", baseline1 = "Automatic", dlev1 = "50%", topline2 = "Automatic", baseline2 = "Automatic", dlev2 = "50%", edgetrigger="Either", inverting = 0, closestedge = 0, x_start = "Begin", x_end = "End", option = "WF")
duty cycle	dutycycle(wf, topline = "Automatic", baseline = "Automatic", edgetrigger="Either", x_start = "Begin", x_end = "End", option = "WF")
fall time	falltime(wf, topline = "Automatic", baseline = "Automatic", low = "10%", mid = "50%", up = "90%", x_start = "Begin", x_end = "End", option = "WF")
frequency	frequency(wf, topline = "Automatic", baseline = "Automatic", edgetrigger="Either", x_start = "Begin", x_end = "End", option = "WF")
gain margin	gainmargin(wf, option = "Value")
intersect	intersect(wf1, wf2, slopetrigger = "Either", inverting = 0, x_start = "Begin", x_end = "End", option = "WF")
maximum	max(wf, x_value="no", x_start = "Begin", x_end = "End", option = "Value")
mean	mean(wf, x_start = "Begin", x_end = "End", option = "Value")
mean +3 standard deviation	meanplus3std(wf, x_start = "Begin", x_end = "End", option = "Value")
mean -3 standard deviation	meanminus3std(wf, x_start = "Begin", x_end = "End", option = "Value")
minimum	min(wf, x_value="no", x_start = "Begin", x_end = "End", option = "Value")
overshoot	overshoot(wf, topline = "Automatic", baseline = "Automatic", x_start = "Begin", x_end = "End", option = "WF")
period	period(wf, topline = "Automatic", baseline = "Automatic", edgetrigger="Either", x_start = "Begin", x_end = "End", option = "WF")
phase margin	phasemargin(wf, option = "Value")
pulse width	pulsewidth(wf, topline = "Automatic", baseline = "Automatic", pulsetype="Either", x_start = "Begin", x_end = "End", option = "WF")
rise time	risetime(wf, topline = "Automatic", baseline = "Automatic", low = "10%", mid = "50%", up = "90%", x_start = "Begin", x_end = "End", option = "WF")
rms	rms(wf, x_start = "Begin", x_end = "End", option = "Value")

Table 6-2. Measurement Tool Functions (cont.)

Function	Syntax
settletime	settletime(wf, steadystate = "Automatic" , tolerance = "5%", x_start = "Begin", x_end = "End", option = "Value")
slewrate	slewrate(wf, topline = "Automatic", baseline = "Automatic", low = "10%", mid = "50%", up = "90%", edgetrigger="Either", x_start = "Begin", x_end = "End", option = "WF"):
slope	slope(wf, x, slopetype = "None", option = "Value")
standard deviation	stddev(wf, x_start = "Begin", x_end = "End", option = "Value")
undershoot	undershoot(wf, topline = "Automatic", baseline = "Automatic", x_start = "Begin", x_end = "End", option = "WF")

Chapter 7
Save and Output Data

All the results can be saved to a disk file in either JWDB format or user-defined ASCII format. You can also add text annotations to your waveforms.

Saving a Waveform Database

After you have derived waveforms (formed from post-processing or from measurements based on original waveforms from the database file), save the waveform database:

1. Right-click the database folder. A popup menu appears.
2. Select **Save As...**. The Save As dialog box opens.
3. Enter the name for the file. If the file already exists, you must confirm the desire to overwrite the database.
4. Specify the file type as one of:
   - MGC Database Files (JWDB) (*.wdb)
   - TXT (text file) (*.txt)
   - Spice pwl (*.sti)
   - CSV (Comma delimited) (*.csv)
5. Click **OK** to apply the settings and close the dialog box.

Saving Multiple Databases

When unsaved data is in the EZwave viewer, you have the capability to save the data without having to perform separate save operations. To save multiple databases:

1. Right-click the Waveform List panel to activate the popup menu.
2. Select the **Save All Databases...** menu item. The item opens the Save Databases dialog box.

The Save Databases dialog box lists all currently unsaved databases or modified databases in the Waveform List panel.

3. Click the checkboxes to select the databases you wish to save. The Wdb Name column shows the current name of the database. The status column displays the status of *Unsaved, Saving* or *Saved*.
4. Use the **Save As** text box to enter the new name for the database. If the file already exists, you must confirm that you want to overwrite the database. If you do not want to be warned about existing databases of the same name, select the **Overwrite if File Exists** option in the lower left corner of the dialog box.
5. Click **OK** to apply the settings and close the dialog box.

Saving Graph Windows

This application can store Graph windows and waveform databases for future use in *.swd* and *.wdb* files. A *.swd* file can store:

- Waveforms associated with the Graph window
- Graph window size, position, axis, and background settings
- Complex waveform transition settings
- Waveform display and cursor settings

Saving a Single Graph Window

To save an individual Graph window:

1. Select the Graph window you want to save.
2. Choose **File** > **Save**.
3. Select the **Save Active Window** option.
4. Enter the filename in the **Location** field. You can use the browse button to select a directory.
5. Select or clear the **Save Related Database** option according to your needs.

   If selected, this option saves a database corresponding to the waveforms in the Graph window being saved. This file is saved with a *.wdb* extension.
6. Click the **Save** button to save the Graph window. If you do not want to be warned about existing files of the same name, select the **Overwrite existing file** option.

The system will save the file and also write a new Mentor Graphics database (*.wdb*) file with the same name as the *.swd* file.

Saving All Open Graph Windows

To save your session, you must save each of your Graph windows. To do this:

1. Choose **File** > **Save**.
2. Select the **Save All Windows** option.
3. Enter the filename in the **Location** field. You can use the browse button to select a directory.
4. Select or clear the **Save Related Database** option according to your needs.

   If selected, this option saves a database corresponding to the waveforms in the Graph windows being saved. This file is saved with a *.wdb* extension.
5. Click the **Save** button to save the Graph windows. If you do not want to be warned about existing files of the same name, select the **Overwrite existing file** option.

The system will save the file and also write a new Mentor Graphics database (*.wdb*) file with the same name as the *.swd* file.

You can change which options are selected by default when saving files by choosing **Edit** > **Options...** and selecting the Save tab.

Restoring Graph Windows

To restore your session, you must open your Graph windows. To do this:

1. Choose **File** > **Open**.
2. From the Open dialog box, select the directory you need.
3. Select the **Saved Window Databases** (**.swd**) filter from the dropdown list.
4. Browse or enter the name of the saved window database (*.swd*) file.
5. Click **OK** to open the database and close the dialog box.

The system will load the Graph window (or windows) and the associated *.wdb* file for the Graph window(s)

Perform these steps for each additional Graph window or group of Graph windows that you want to open.

Printing a Graph Window

You can print the contents of a Graph window by performing the following:

1. Select the Graph window you wish to print.

2. Choose **File** > **Print**.
3. In the **Print** dialog box, select the print destination (or export to a file), paper size, and number of copies.
4. Click **OK** to print.

Exporting a Graph Window to JPEG

You can export the contents of a Graph window to a JPEG image file by performing the following:

1. Select the Graph window you wish to export.
2. Choose **File** > **Export**.
3. In the Export Active Window dialog box, select the directory you want to save the file.
4. In the text area, type the name you want for the saved Graph window, using **.jpg** or **.jpeg** as the extension.
5. Click **Save** to export to a JPEG file and close the dialog box.

Adding Text Annotations

To add a text annotation to a waveform:

1. Select the location on the desired waveform, and right-click to display a popup menu.
2. Choose **Annotations** > **Add Text Annotation** from the popup menu. The Waveform Annotation dialog box displays.
3. Enter the desired text (up to 128 characters) and click **OK**. The text annotation displays on the waveform. You can move the annotation to anywhere within the graph row.

Recovering Save Files

The application provides two different methods of recovering database files. One method allows you to recover incomplete database files produced when a simulator that the EZwave viewer was connected to does not exit cleanly. The second method recovers databases that are saved incompletely, such as might be the case during a disk write error or a network shutdown.

Recovering from Incomplete Simulations

Use the **recoverjwdb** utility to recover simulation data and save it to a **jwdb** file in the event of an unclean simulator exit. During simulation, the simulator may create an information file called **jwdb***PortHostname* containing information about the simulation process. If the EZwave viewer is still running, this utility can retrieve simulation data from memory or from this spill file.

To invoke **recoverjwdb**, use the following syntax:

```
recoverjwdb info_file save_path
```

where *info_file* is the simulator information file.

Recovering Incomplete Savefiles

While the EZwave viewer is running, a temporary file named *file***.wdb_recoveryKeyFile**, containing the necessary information to recover the databases, is created. This temporary file is removed when the EZwave application exits normally. If an abnormal exit condition occurs, this recovery key file will remain and can be used to recover any unsaved data from the simulation. The following command allows you to use this temporary file to recover incomplete savefiles in this event:

```
ezwave -recovery file.wdb file.wdb_recoveryKeyFile output_file
```

where *file* is the original file you were working with.

If disk space runs out during a simulation, the EZwave viewer will display a notice that this has occurred and will prompt you for an alternate location to save the remainder of the database file. The first part of the savefile is saved in the original disk location as *file***_recovery_part1**, and the remainder will be saved in whatever location you specify as *file***_recovery_part2**. The file will be saved in two parts even if you remove files in the original disk partition and elect to save the remainder of the database there.

To recover the incomplete savefile in this case, use the following command format:

```
ezwave -recovery file_recovery_part1 file_recovery_part2 output_file
```

where *file* is the database savefile you were using.

If the recovery key file does not produce satisfactory results, the recovery mechanism can be disabled by using the **-norecovery** command line option.

Converting a JWDB File to ASCII

You can convert a JWDB savefile to ASCII in batch mode (that is, without having to open the file using the EZwave tool and save it as ASCII) by using the *jwdbtoasc* utility. All signals, both analog and digital, can be converted using this tool. You can also specify a Tcl script to run for post-processing before the converted waveforms are saved to the ASCII file. The syntax for this tool is as follows:

```
jwdbtoasc { -i filename.wdb } [ -o filename.txt [ -s filename.tcl]]
```

The *-i* option specifies the input JWDB filename; the *-o* option specifies the output ASCII filename; and the *-s* option specifies the post-processing Tcl script name. If the output file is not specified, the filename is the same as the input filename with the *.wdb* extension changed to *.txt*.

Chapter 8
Tutorials

This chapter provides several tutorials to help you learn how to use the EZwave application. The first tutorial describes the overall process flow for the EZwave tool, while the other tutorials provide extra information about specialized processes within the EZwave viewer.

- EZwave Process Flow Tutorial
- Waveforms Tutorial: Add Complex Waveforms
- Analysis Tutorial: Measuring Pulse Width
- Post-Processing Tutorial: Jitter Analysis

EZwave Process Flow Tutorial

This tutorial takes you through a basic flow of using the EZwave viewer. When verifying signal behavior for a particular circuit design, it is often necessary to visualize the waveform data generated from the simulator and verify the timing and delay between signals. In this tutorial you will perform the following tasks based on a real example.

- Stage 1: Set Up and Load Database
    - Set up the EZwave viewer and load tutorial data.
- Stage 2: Add Waveforms
    - Add a single waveform
    - Learn zooming actions and place the first cursor
    - Place a second and lock cursors before dragging
    - Insert a third cursor
- Stage 3: Analysis
    - Placing a cursor at the start and finish of the first (high) pulse
    - Measure the low pulse width
    - Comparing pulse widths of two waveforms
- Stage 4: Post-Processing (Measurement Tool for Jitter Analysis)
    - Measuring waveform values using the measurement tool

  - o Calculating and plotting analysis results (creating a jitter analysis)
- Stage 5: Save and Output Data
  - o Save your session data to a file.

Stage 1: Set Up and Load Database

This part of the tutorial explains how to set up the tutorial data for the EZwave viewer. Before starting this tutorial, you should have performed the following tasks:

- Installed the application.
- Set or verified EZwave environment variables.
- Invoked the application (either by the command line or from another host application). Refer to Chapter 3, "Set Up and Load Data", for further information.

Typically, you can load a database by choosing **File** > **Open** (or clicking the **Open** toolbar button) and selecting a waveform database file (.*wdb*) file from the Open dialog box.

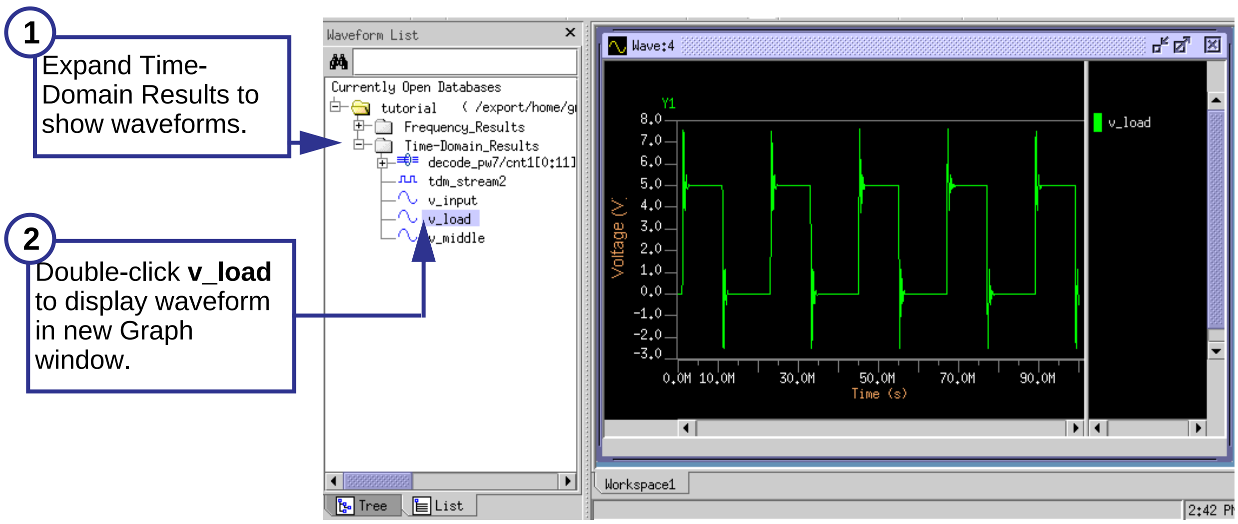
However, for this tutorial, a sample database has been created for your use. To load this database:

1. On your computer, create a directory named *TUTORIAL* at a location you can easily find. You will use this directory to save your tutorial work and databases that you want to reference.
2. Within the viewer, make sure your Waveform List panel shows **No Databases Open**. If you have open databases, close them and any Graph windows that contain plotted data.
3. In the main EZwave window, choose **Help** > **Tutorial** > **Tutorial Data** to load the tutorial database into the EZwave viewer. A **tutorial** folder appears with two subfolders: **Frequency Results** and **Time-Domain Results**.

Stage 2: Add Waveforms

Add a Single Waveform

This part of the tutorial explains how to add a waveform.



1. Expand the Time-Domain Results folder to display the waveforms contained in the folder.
2. Double-click the **v_load** waveform with your mouse to plot it on the Graph window. If a Graph window is not displayed, a new Graph window is automatically created.

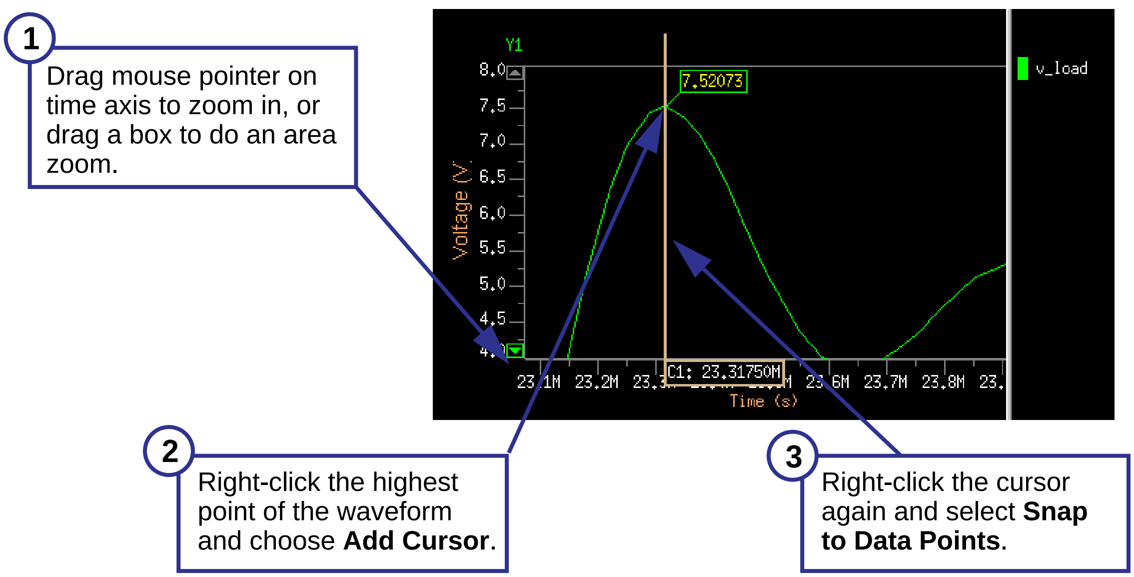
   The waveform appears in the Graph window. Close the Waveform List panel so you have more viewing space by clicking the **Close** button (×) in the upper right hand corner of the Waveform List panel.

   With your waveform plotted, you are ready to place your first cursor.

Stage 3: Analysis

This part of the tutorial explains how to use cursor placement to obtain measurements and deltas between cursors.

Zoom and Place Cursors



1. In the Graph window, zoom in on the highest peak (the Y value or overshoot value) and the time point (the X value) of the first pulse by clicking the left mouse button and dragging your mouse pointer on the Time axis. Alternatively, you could do an area zoom.

Note

If you want to reverse your zoom action, use the **Undo Zoom** button on the toolbar.

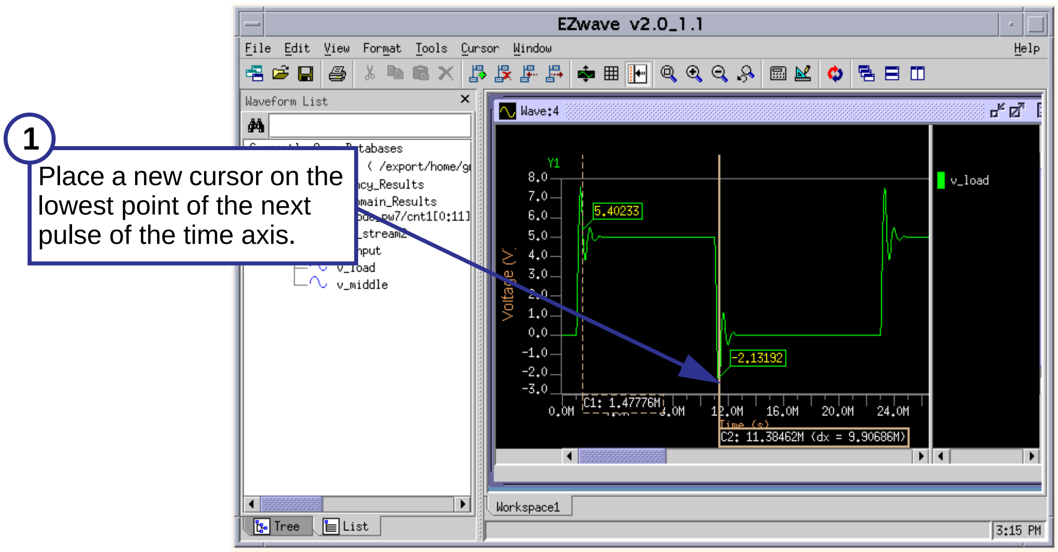
2. Place your mouse pointer near the highest point of this pulse and right-click to display the popup menu. Select **Add Cursor**. This adds a new cursor, labelled **C1**.

3. Now use the **Snap** feature to move the cursor into position. Right-click the cursor to display the popup menu and select **Snap to Data Points**.

   You may need to zoom in tightly to see the cursor snap to the closest point. You can also use the **Move** cursor buttons on the toolbar to move the cursor to the highest point.

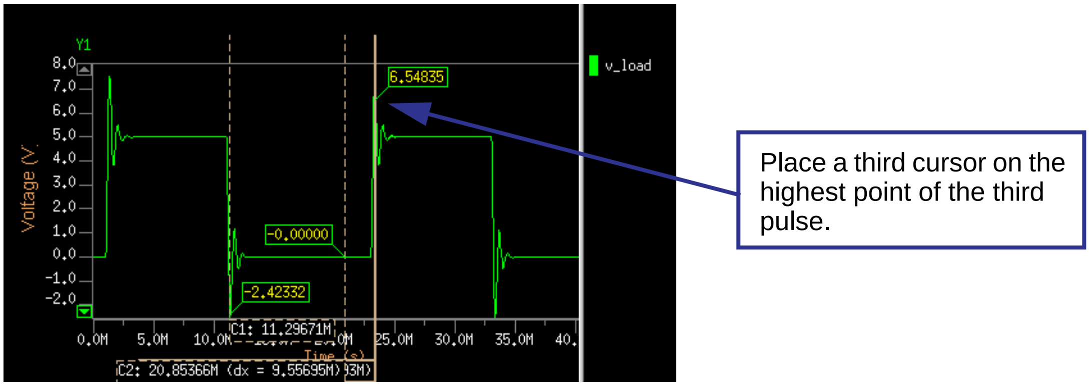
4. Use the **View All** button on the toolbar to see the entire waveform.

Place the Second Cursor



1. Zoom in on the area of the second pulse on the time axis.
2. Place a second cursor (**C2**) on the lowest point (the Y value or the undershoot value) and time point (X value) of the waveform in this area by placing your mouse pointer near the lowest point of this pulse and right-click to display the popup menu. Select **Add Cursor**. If needed, use the **Snap** feature to move the cursor into position.
3. With the new cursor in position, use the **View All** button on the toolbar to see the entire waveform with your two cursors. Looking at the two cursors, note the distance between the two cursors.

Insert a Third Cursor



1. Perform an area zoom around the third pulse.
2. Once this area displays, drop another cursor (**C3**) near the highest point of the third pulse and use **Snap** to move this cursor into position. Zoom in if needed.
3. Click the **View All** button to view the entire display. You should now see three cursors, **C1**, **C2**, and **C3**.
4. Observe the values for each of the cursors, particularly the **dx** values listed in the Value flags for **C2** and **C3**. The **dx** value listed for **C2** is the delta between **C1** and **C2**. The **dx** value listed for **C3** is the delta between **C1** and **C3**.
5. To calculate the pulse width value, divide the **dx** value between **C1** and **C2** by the **dx** between **C1** and **C3**.
6. Click the **Add Delta** button on the top toolbar. This locks the waveform in place.
7. Place your mouse on the leading edge of the waveform, then left-click and drag the mouse pointer to the next leading edge. You should see two bars appear: the first set from your starting point, the second set on where your cursor currently points to. The current delta between the two points is shown in between the two bars.
8. Release the mouse button. A Value flag appears with the final delta measurement appears.

Stage 4: Post-Processing

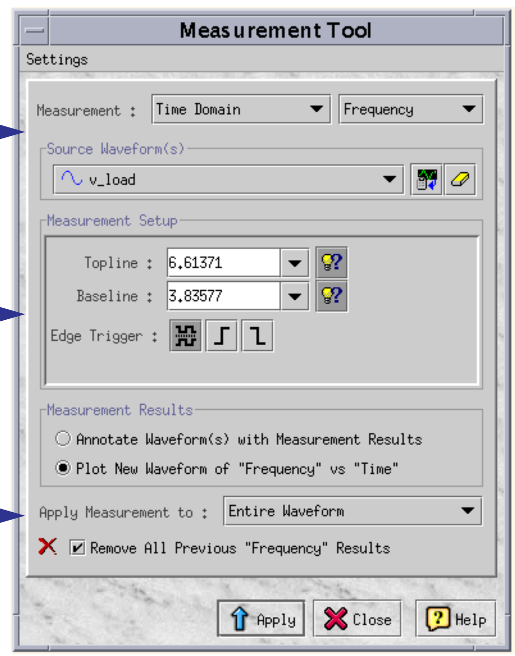
This part of the tutorial explains how to post-process data to obtain timing measurements and deltas of a waveform. With your waveform plotted, you are ready to analyze your data using the Measurement Tool.

Measuring Waveform Values Using the Measurement Tool

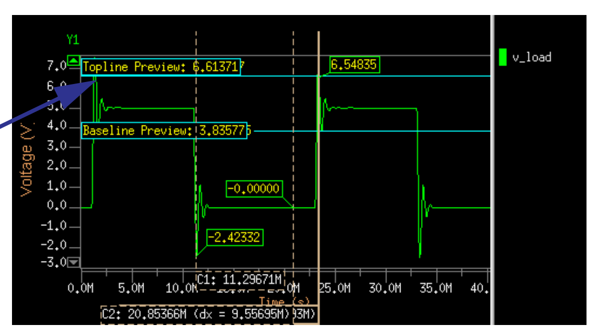
1. In the Measurement Tool, select the waveform, then **Time Domain** and **Frequency** from the pulldown menus.

2. Select the **Threshold Topline** and a **Threshold Baseline** (these appear as blue lines on the Graph window.)

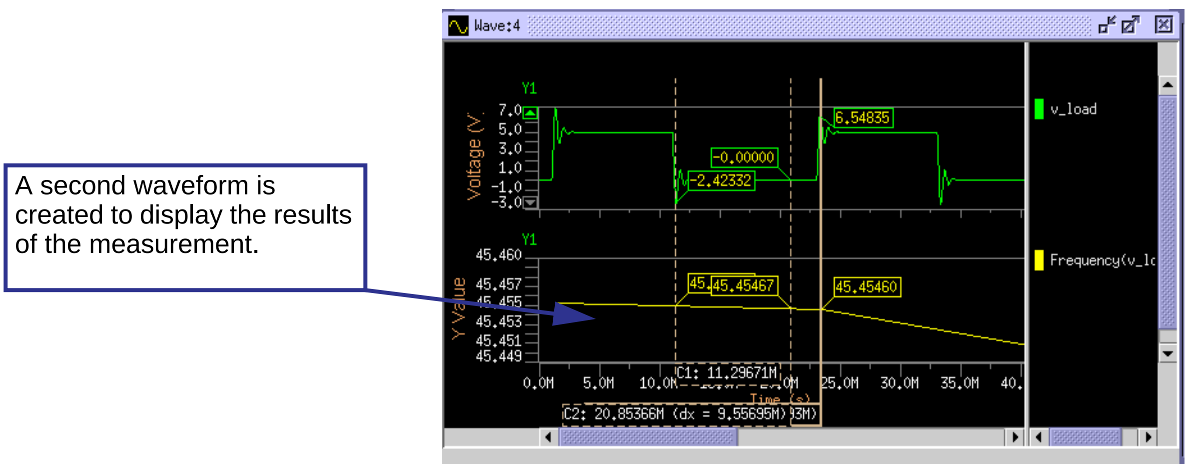
3. Select the **Entire Waveform** to apply the measurement.



4. The **Threshold Topline** and **Baseline** selections appear as blue lines on your waveform.



1. Select **Tools** > **Measurement Tool** menu item to open the Measurement Tool window, or in the active Graph window, right-click on the waveform name. Select Measurement Tool from the popup window.
2. Select the measurement type **Time Domain** and the category **Frequency** using the pulldown menus. The look of the Measurement Tool window will change as you select the different measurement types and categories to reflect the different setup and result types.
3. Click on the select button to add your waveform to the Source Waveform field.
4. Specify an appropriate **Threshold Topline** value. Click on the preview button to display the Topline level on the specified waveform. The preview appears in the Graph window.
5. Specify an appropriate **Threshold Baseline** value. Click on the preview button to display the Baseline level on the specified waveform.
6. Click on the preview buttons to show the **Topline** and **Baseline**.
7. Use the default Rising or Falling Edge trigger button.
8. To present the measurement results, check **Plot New Waveform**. When **Plot New Waveform** is selected a new Graph window will open if necessary.
9. Select **Entire Waveform** in the **Apply Measurement** to field.
10. Check **Remove all previous "Frequency" Results**.
11. Click **Apply**. This will create a new waveform.



Stage 5: Save and Output Data

This part of the tutorial explains how to save your updated Graph window data into a Saved Window (*.swd*) file.

Save Window Data

1. Save the Graph window using the **File** > **Save** command. Select the **Save Active Window** option and make sure that the **Save Related Database** option is selected. Browse to your *TUTORIAL* directory and save the file as **tutorial1**. The system will save the file as a Save Window Databases (**.swd**) file and also write a new Mentor Graphics database (**.wdb**) file with the same name.
2. Close the Graph window.
3. Use **File** > **Open** to open the **tutorial1.swd** file you just saved. A new Graph window appears with your waveform and cursors. Observe how the waveforms and cursor settings are immediately established for use.
4. Open the Waveform List panel by clicking the Waveform List panel button on the toolbar or by choosing **View** > **Waveform List**. You will see the new database loaded in the viewer in the Waveform List panel.

Export Graph Window Data to JPEG

Export your Graph window information to a JPEG, essentially “taking a snapshot” of the Graph window current state with annotations.

1. Select **File** > **Export**.
2. In the Export Active Window dialog, save the Graph window information as a file called **tutorial1.jpeg**. The EZwave viewer takes a snapshot of your current Graph window state and saves it to JPEG format.

Save Graph Window Data to an ASCII File

Save your Graph window data to an ASCII file.

1. Right-click the database folder. A popup menu appears.

2. Choose **Save As**. The Save Options dialog box opens.
3. Select the Entire Waveforms option.
4. In the Location field, enter **tutorial1.txt** as the file name.
5. Specify the file type as TXT (text file) (*.txt).
6. Click **Save** to save the data and close the dialog box.

With your measurements and cursors completed and saved, you have finished this tutorial. For more in-depth examples of using the EZwave application, try the additional tutorials in the following sections.

Waveforms Tutorial: Add Complex Waveforms

An advanced feature of the EZwave viewer is its ability to manage complex waveforms. This tutorial uses complex waveforms to establish different transformation effects and axis settings.

1. On your computer, create a directory named **TUTORIAL1** at a location you can easily find. Use this directory to save your tutorial work and databases that you want to reference.
2. Within the EZwave viewer, make sure that your Waveform List panel shows **No Databases Open**. If you have open databases, close them as well as any Graph windows that contain plotted data.
3. From the menu bar, choose **Help** > **Tutorial** > **Tutorial Data** to load the tutorial database into the EZwave viewer.
4. The **tutorial** folder appears, containing two sub-folders: **Frequency Results** and **Time-Domain Results**.
5. Expand the **Frequency Results** folder to display the waveforms contained in the folder.
6. Select the **v_load** waveform with your mouse and drag it onto the Graph window and release the mouse. If you do not have a Graph window currently displayed, dragging the waveform onto the Workspace will create a new Graph window to use when you release the mouse.

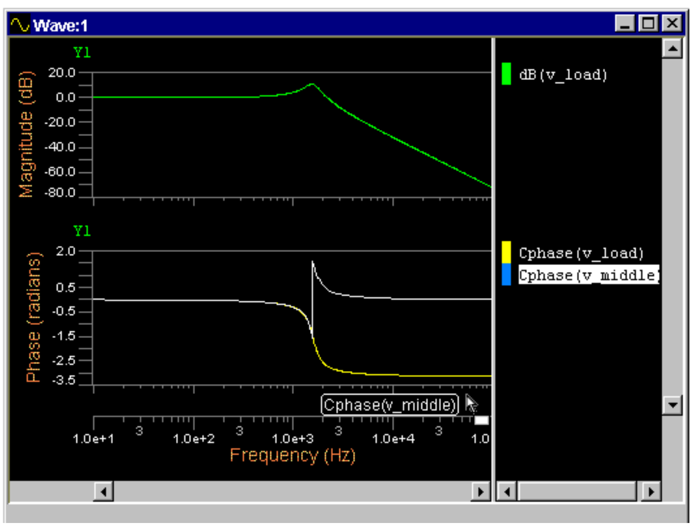
   As you drag the mouse on to the Graph window, you will see a pair of squares at the base of the cursor, indicating that a copy of the waveform is being placed.

Next, you will add new waveforms into the existing row.

Adding a New Complex Waveform and Moving Complex Waveforms

v_load is a complex waveform that appears with transformations of dB and Continuous Phase values applied. These transformations are plotted overlaid. You will now see how additional waveforms would appear plotted overlaid with the transformation immediately applied.

1. Place your mouse pointer on the **v_middle** waveform from the Waveform List panel and drag it into the **v_load** plot.
2. As you release the mouse, the **v_middle** waveform plots overlaid with the **v_load** plot. Both default transformations (continuous phase and dB) are immediately applied.
3. Separate the overlaid waveforms by using CTRL + click on the **v_middle** waveform labels (appearing to the right of the waveform) and dragging them below the row to establish the transformed waveforms in separate rows. The cursor does not have the pair of squares at its base, indicating that the waveforms are being moved, and not copied. In order to make copies, press the **CTRL** key when you drag the waveform(s).



Next, you will change the transformations applied for affect on the waveform.

Changing Transformations with the Popup Menu

We will now change the transformation of the **v_load** Continuous Phase plot to Imaginary.

1. Right-click anywhere on the **cphase(v_load)** waveform itself to display the popup menu. The Transformations menu item expands to show the other selections available. Choose **Imaginary** to change the transformation to this method.
2. On the dB transformation of the **v_load** waveform, use the popup menu (right-click the waveform), and select the **Properties** menu item to see the settings for this waveform.

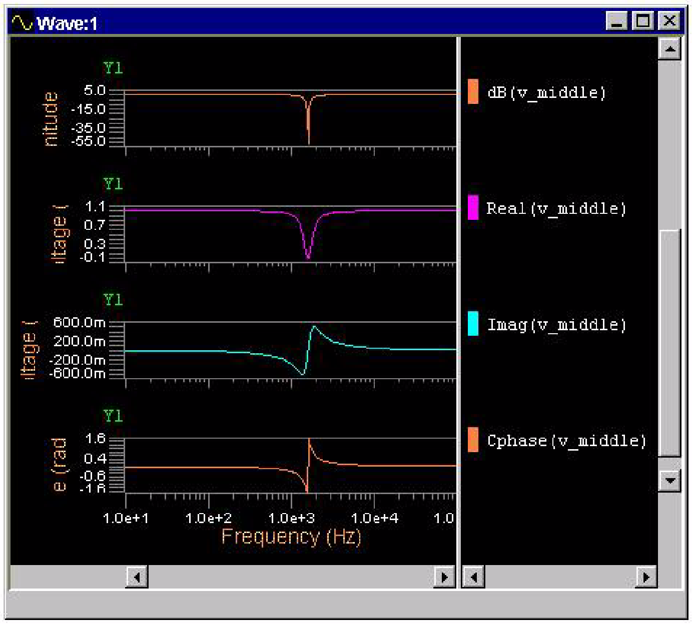
3. When the Properties settings box appears, select the **Transformations** tab and then change the checkbox to the **Real** setting.
4. Click **OK** to apply the settings and close the Properties box.
5. Go to the next section to see how to make a default transformation setting

Setting Default Transformations Using the Options Dialog Box

Make the four transformations (dB, Continuous Phase, Real and Imaginary) the preferred way to see all complex waveforms. This part of the tutorial makes these transformations a default setting for the viewer.

1. Choose **Edit** > **Options** to open the Options Settings dialog box. Then select the Transformations tab to see the current default settings.
2. Select **Real and Imaginary** to add to the current default settings of dB and Continuous Phase. Leave the checkbox next to **Selected Transformations Should Be Plotted Overlaid** unselected to avoid these four transformations being overlaid as a default plotting condition.
3. Click **OK** to apply the new settings and close the dialog box.
4. Plot the second waveform now. From the Frequency Results folder, right-click the **v_middle** waveform and select **Plot** from the popup menu.
5. The **v_middle** waveform appears in four rows, one for each of the default transformations. These four rows are at the bottom of your active Graph window. A scroll bar may appear to the right so you can scroll up to see the first three rows that contain the **v_load** and **v_middle** waveforms. Scroll your Graph window to see your

seven rows of waveforms. Return to the bottom of the active Graph window for the next step.



6. Place your mouse pointer on the label for the Imag (**v_middle**) waveform and drag it over the Real (**v_middle**) waveform to create an overlaid plot of two different transformations. Then move the dB (**v_middle**) waveform below the Cphase (**v_middle**) waveform to create this new comparison view.

With this new default display this way, the next part of the tutorial describes how to change axis settings.

Changing Axis Settings from Degrees to Radians

The Y-axis for Phase transformations is set for degrees, but you will change this axis to display in radians.

1. Right-click the Y-axis to display the popup menu and select the **Properties** menu item.
2. From the Y1-Axis Properties dialog box, change the setting in the Axis Units section from degrees to radians using the drop-down list.
3. Check the checkbox next to **Apply to All "Phase" Axes in the Current Window**.
4. Click **OK** to apply the setting and close the dialog box.

With the axis set to radians, go to the next section to create a new Graph window for Phase Analysis.

Create the Phase Analysis Window

1. Select the dB (**v_middle**), Imag (**v_middle**) and Real (**v_middle**) waveforms by using CTRL + click.

   Once you have selected these waveforms, drag them below the last waveform to move them to a new location.

   Compare both the **v_load** and **v_middle** waveforms from a Phase aspect.

2. First, select the **v_load** waveform from the Waveform List panel and drag it into the third row in your Graph window. This row should contain the **v_middle** waveform with Continuous Phase transformation.

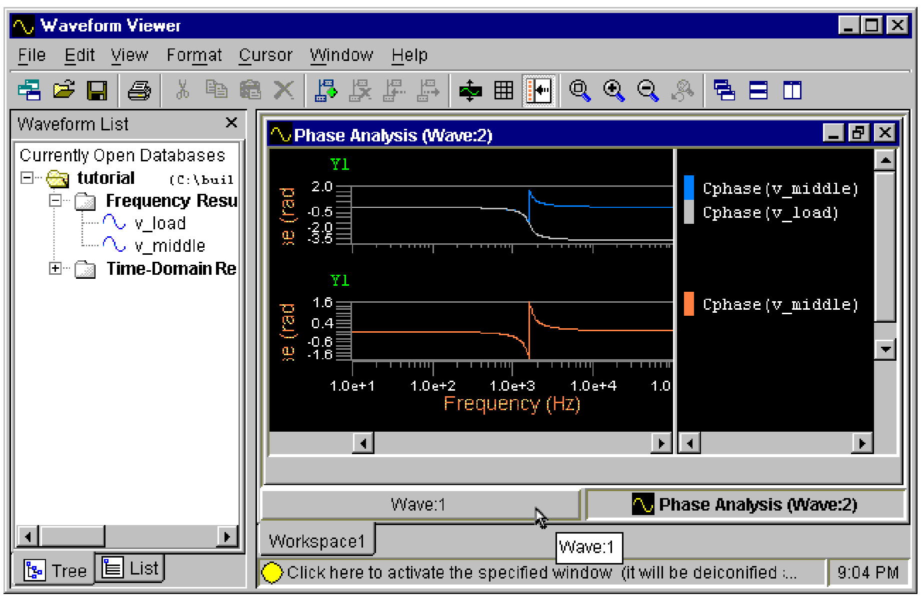
3. You should now see the third row with the **v_load** and **v_middle** waveforms overlaid with Continuous Phase transformation. The second row should contain only the **v_middle** waveform with Continuous Phase transformation applied.

4. Select the waveforms from both of these rows using area select. Now press the **CTRL** key on your keyboard to drag these waveforms to the workspace. You will see the small plus sign appear indicating you are dragging a copy.

   Drag the copy of the waveforms to the workspace and release the mouse pointer. This creates a new Graph window with the waveforms plotted.

5. Now that this Graph window is the active Graph window, choose **Window** > **Title** from the menu bar to rename this Graph window to Phase Analysis.

6. Your work area will now show two Graph window buttons on the taskbar (at the bottom of the application window) for your original Graph window and your new Phase Analysis window.



Use your new Phase Analysis window to compare the two transformations. While this window is helpful for independent analysis, you do not need to save it for future use. You do want to save the first Graph window however, as it has all the transformations and waveform layouts.

7. Click the toolbar button for your first Graph window to make that window active. Save the Graph window using the **File** > **Save** command:
   a. Select **Save Active Window** and make sure that **Save Related Database** is selected.
   b. Browse to your **TUTORIAL1** directory and save the file as **tutorial1.swd**.
8. Close all windows and databases.
9. Use **File** > **Open** to open the **tutorial1.swd** file you just saved.
10. Observe how the waveforms and window settings are immediately established for use.

With your complex waveforms completed and saved, you have finished this tutorial.

Analysis Tutorial: Measuring Pulse Width

In this tutorial, you will be measuring the pulse width of your tutorial waveforms

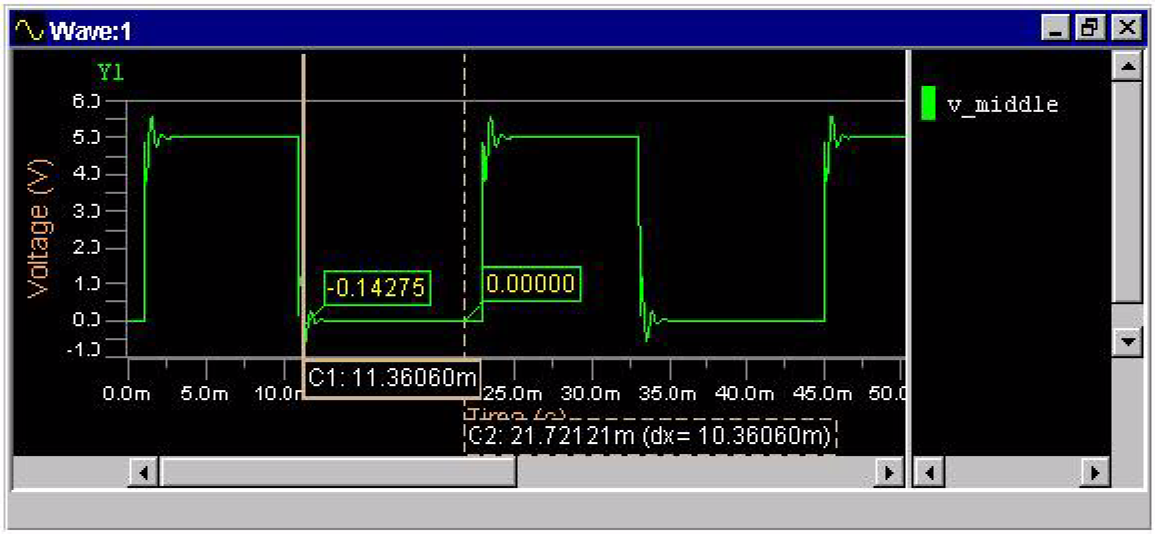
1. Within the EZwave viewer, make sure that your Waveform List panel shows **No Databases Open**. If you have open databases, close them as well as any Graph windows that contain plotted data.
2. From the menu bar, choose **Help** > **Tutorial** > **Tutorial Data** to load the tutorial database into the EZwave viewer.
3. The **tutorial** folder appears, containing two sub-folders: **Frequency Results** and **Time-Domain Results**.
4. Expand the Time-Domain Results folder to display the waveforms contained in the folder.
5. Double-click the **v_middle** waveform with your mouse to plot it on the Graph window. If no Graph window is displayed, a new Graph window is automatically created.
6. The waveform appears in the Graph window. You can close the Waveform List panel so you have more viewing space.
7. With your waveform plotted, you are now ready to investigate the first (high) pulse.

Placing a Cursor at the Start and Finish of the First (High) Pulse

1. Perform an area zoom around the 0.0 volts area of the first pulse on the v_middle waveform.
2. Right-click to bring up the popup menu. Choose **Add Cursor** to place the C1 cursor on the first point where the waveform leaves 0.0 volts.
3. Use **Snap to Data Points** to place move the cursor in place.
4. Use the View All button on the toolbar to view the entire display.
5. Perform an area zoom in the next area where the waveform again crosses 0.0 volts.
6. Drop the next cursor near 0.0 volts. Move the cursor into position using the Move Cursor buttons on the toolbar.
7. Turn off the grid lines by clicking on the grid lines button on the toolbar.

   You have finished investigating the pulse width for the high pulse. The following section explains measuring the low pulse width.

Measure the Low Pulse Width



1. Choose **Cursor** > **Lock Together When Dragging** to lock the cursors before moving them.
2. Click the **View All** button on the toolbar to see the entire display.
3. Right-click the C2 cursor and choose **Copy X to Clipboard**.
4. Right-click the C1 cursor and choose **Move To...**. In the **Move Cursor** dialog box, paste in the value of cursor 2 (C2) for the new X location. The cursor moves to the new position with the second cursor moving an equal distance.
5. Remove the dragging lock by selecting the **Cursor** menu and clearing the checkmark on **Lock Together When Dragging**.
6. Drop another cursor to the right of the C2 cursor and use the **Move Cursor** toolbar buttons to advance the cursor until it reaches 0.0.
7. Once all the cursors are place, use **Lock Together When Dragging** and move the C1 cursor back and forth to observe the difference.

   Now you can compare this data to the measurements you took previously with the **v_load** waveform.

Comparing Pulse Widths of Two Waveforms

1. From the menu bar, choose **File** > **Open** to display the Open dialog box.

   In the dialog box, browse to your **Tutorial** directory and select the **Tutorial1.swd** file. A new Graph window will open with your waveform and cursors displayed. The taskbar now shows buttons for each of the Graph windows.

2. Select each button to make that Graph window the active window for display.
3. Compare the Delta X values of the C3 cursor for each Graph window.
4. Close all Graph windows.
5. Open the Waveform List panel by clicking the Waveform List button on the toolbar. Right-click in the Waveform List panel to access the **Waveform List** popup menu, and select **Close All Databases**. Confirm the closure by clicking **Yes**.

With your measurements and cursors completed, you have finished this tutorial.

Post-Processing Tutorial: Jitter Analysis

This tutorial explains how to use post-processing to obtain measurements and deltas between elements of a waveform. With your data analyzed, you are ready to calculate the Jitter Analysis using the Waveform Calculator.

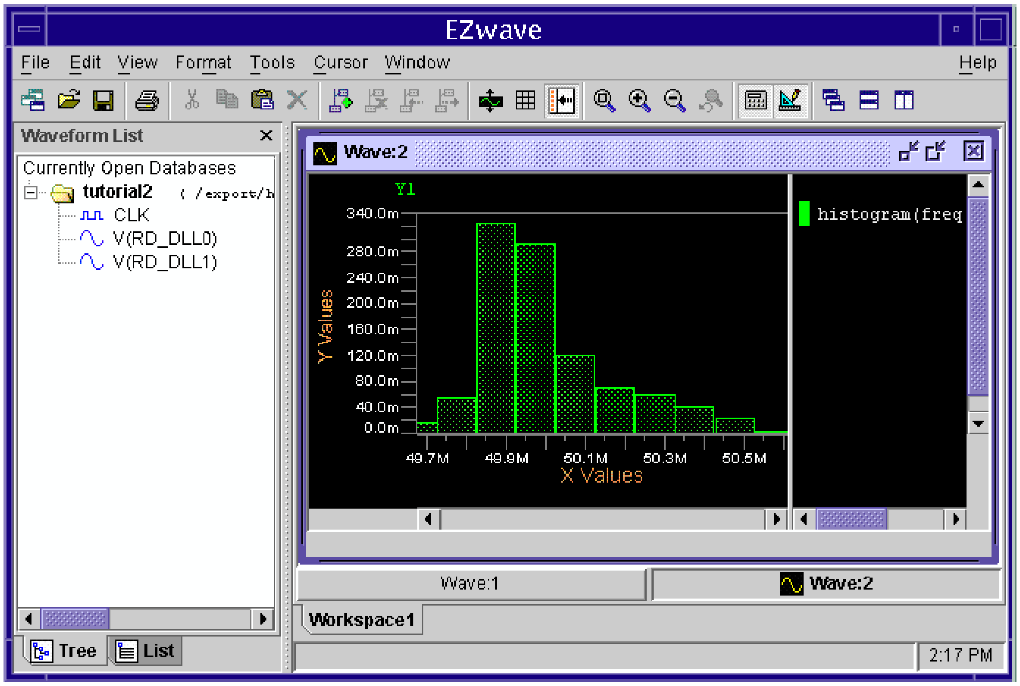
1. Within the EZwave viewer, make sure your Waveform List panel shows **No Databases Open**. If you have open databases, close them and any Graph windows that contain plotted data.
2. Choose **File** > **Open** to load your database into the EZwave viewer.
3. Expand the database folder to display the waveforms contained in the folder.
4. Double-click a compound waveform with your mouse to plot it on the Graph window. If a Graph window is not displayed, a new Graph window is automatically created.

   The waveform appears in the Graph window. Close the Waveform List panel so you have more viewing space by clicking the Close button in the upper right hand corner of the Waveform List panel.
5. Select **Tools** > **Waveform Calculator** to open the Waveform Calculator window.
6. Select the calculation type statistical using the pulldown menu.
7. Click the histogram button on the calculator keypad (if available) or double-click the **histogram** function in the funcs tab.
8. Enter the following parameters (these values will vary depending on your particular waveform):
   a. Enter the waveform name from the active window.
   b. Enter the minimum X value.
   c. Enter the maximum X value.
   d. Enter the number of bars to chart.
   e. Select **Use Data Points** for sampling.

f. Click **OK**.

9. Click the **Eval** button to calculate the values for the histogram.

10. Click the **Plot** button to plot the results of the calculation. The resulting histogram shows the results of your Jitter Analysis of a waveform.



In this tutorial you have calculated and displayed the results of a Jitter Analysis using the EZwave viewer's Waveform Calculator. You can print or save the results of these calculations by using the Print or Export commands from the **File** pulldown menu.

Appendix A
Eldo Simulator Data Collection

The Eldo® simulator outputs waveform data that can be displayed by the EZwave viewer. The EZwave viewer works with the Eldo simulator in the following scenarios:

Scenario 1: Run the Eldo Simulator With the EZwave Viewer

In this scenario, the Eldo simulator runs a complete simulation and outputs the data in JWDB format to be directly viewed by the EZwave viewer. You can use one of the following methods:

- Invoke the Eldo simulator from the command line, as in the following example:

  ```
  eldo test.cir -ezwave &
  ```

  This command invokes the Eldo simulator and directs it to run a complete simulation and output the data to a file.

  The simulator regularly saves incremental data to the disk (by default, each 100Mbs of data). This allows you to run very large simulations without consuming too much memory.

  Use the **-noisaving** option to disable incremental saves inside the Eldo simulator.

- Use a pre-defined configuration:

  ```
  eldo test.cir -ezwave -wdb_config config.swd &
  ```

  The simulator requests that the EZwave viewer display waveforms as defined in the **config.swd** file (this is an EZwave **Save Window** file) instead of the **.plot** statements defined in the netlist **test.cir**. If some post-processed waveforms were stored through **config.swd**, they will be automatically recomputed with new simulation data.

  When the simulation is completed, the simulator exits and the EZwave application continues running until you exit the program.

Scenario 2: Complete Eldo Simulation and View Simulation Data Later

In this scenario, the Eldo simulator runs a complete simulation and outputs the data in JWDB format to be read by the EZwave viewer. In the EZwave viewer, the data can be organized, and the window contents can then be saved for later viewing.

1. Invoke the Eldo simulator, as in the following example:

   ```
   eldo test.cir
   ```

   This command invokes the Eldo simulator and directs it to run a complete simulation and output the data to a file.

   Alternatively, if you want to reuse the JWDB server launched by the Eldo simulator for other Eldo simulations, use the **-jwdb_servermode** option, as in the following example:

   ```
   eldo test.cir -jwdb_servermode
   ```

   This setting can also be specified in the **eldo.ini** file. Refer to the Eldo simulator documentation for further details.

2. To display simulation results, invoke the EZwave tool.
3. In the EZwave viewer, use the **File** > **Open** menu to open the JWDB file generated by the simulator. The waveform data appears.

   You can organize data in different graph rows and create some post processing waveforms. You can save the window contents using the **File** > **Save** option and then reuse the "saved window" **.swd** file later on.

For this release, the following limitations apply for this scenario:

- The post-processed waveform is not automatically updated during the simulation.
- If the EZwave viewer still displays data at the end of the simulation, the data is "reloaded" from the disk. This can be time-consuming.
- Having the EZwave viewer display multiple-run simulation results may lead to internal errors.

EZwave Reload Command

File > **Reload** in the EZwave viewer is a shortcut to update waveforms data in the EZwave viewer with new simulated data in a single action. It also automatically updates all post-processed waveform data. To use the reload command:

1. Invoke the Eldo simulator, as in the following example:

   ```
   eldo test.cir
   ```

   This command invokes the Eldo simulator and directs it to run a complete simulation and output the data to a file.

2. To display simulation results, invoke the EZwave tool.
3. In the EZwave viewer, choose **File** > **Open** to open the JWDB file generated by the simulator. The waveform data appears.
4. You can organize data in different graph rows and create post-processing waveforms.

5. Modify simulation parameters in **test.cir** and run another simulation:

   ```
   eldo test.cir
   ```

6. In the EZwave viewer, choose **File** > **Reload** to update waveforms with new simulated data.

Scenario 3: Manual Status Update

Waveform data can be manually collected from a running simulation at an interval of your own choosing. This enables you to get a status update on a running simulation.

1. Invoke the Eldo simulator using one of the following methods:

   - Invoke with the EZwave tool:

     ```
     eldo test.cir -ezwave &
     ```

   - Output in JWDB format:

     i. Invoke the Eldo simulator and run a complete simulation, as in the following example:

        ```
        eldo test.cir &
        ```

     ii. In the EZwave viewer, choose **File** > **Open** to open the **.wdb** file generated by the simulation.

2. To update the data in the EZwave viewer, click the **Update Waveform Data** button in the EZwave toolbar. This updates displayed waveforms with new simulation data.

Note

If **jwdb_servermode** is set (from the command line or in the **eldo.ini** file) when an Eldo simulation is invoked, the simulation output data cannot be accessed until after the simulation completes.

Scenario 4: Marching Update

Waveform data can be collected from a running simulation at predefined set intervals. The interval is set in the EZwave tool and is run simultaneously with the Eldo simulator. This automates the process of updating waveform data viewed in the EZwave viewer.

1. Invoke the Eldo simulator using one of the following methods:

   - Invoke with the EZwave tool:

     ```
     eldo test.cir -ezwave &
     ```

- Output in JWDB format:

    i. Invoke the Eldo simulator and run a complete simulation, as in the following example:

    ```
    eldo test.cir &
    ```

    ii. In the EZwave viewer, choose **File > Open** to open the **.wdb** file generated by the simulation.

2. In the EZwave viewer, choose **Edit > Options** to invoke the Options dialog box. In the Options dialog box, select the **General** tab. This takes you to the General options page.

3. In the General options page, go to the **Marching Waveforms** area and set the update interval using either of the following options:

    - **Automatically Update Displayed Waveforms Every** *X time interval*: The *time interval* can be by second, minute, or hour.

    - **Automatically Update Displayed Waveforms Every** *X* **% of Simulation**: This updates based on the percentage completion of the simulation.

Be careful not to set too small of an interval. Setting a short interval increase the number of updates and, thus, the amount of resources globally used to update the waveform data viewed in the EZwave viewer.

Note

If **jwdb_servermode** is set (from command line or in the **eldo.ini** file) when an Eldo simulation is invoked, the simulation output data cannot be accessed until after the simulation completes.

Appendix B
Tcl Scripting Support

The EZwave application supports Tcl scripting, enabling you to create batch files to execute Tcl commands from within the EZwave application.

The following is a short example of how to use Tcl commands with the EZwave application.

1. Create a text file **test.tcl** and copy in the following lines:

```
## open the tutorial

dataset open $env(AMS_VIEWER_HOME)/lib/tutorial.wdb

## perform a calculation

set wf [wfc
{wf("<tutorial/Time-Domain_Results>v_load")-
wf("<tutorial/Time-Domain_Results>v_middle")}]

## plot the result add wave

add wave $wf

## print window contents to a PostScript file

write wave -file $env(HOME)/test.ps

## then exit

exit
```

2. Run the following command from your terminal:

```
ezwave -do test.tcl
```

This command invokes the EZwave application and loads the Tcl commands contained in the **test.tcl** file.

EZwave Tcl Commands

The Tcl commands listed in Table B-1 are used to emulate EZwave functionality:

Table B-1. Supported Tcl Commands

Command	**Description**
add wave <`handle`> [<handle> ...]	Add a new waveform.
batch_mode	Check if the Tcl program is in batch mode.
dataset open ***filename***	Open a database file.
evalExpression wfc	Invoke the EZwave Waveform Calculator and perform operations. **evalExpression** and **wfc** may return different values, depending on the type of output. Refer to the entries on the following pages for more details.
write wave [*file*.ps | [-printer *printer_name*] [-file *file*.ps] [-window *window_name*] [-landscape] [-portrait]]	Output a waveform to a printable (PostScript) file, or print a waveform to the specified device.

add wave — Add New Waveform

Usage

```
add wave <handle> [ <handle> ... ]
```

Description

This command adds a new waveform to a database.

Parameters

`handle` — A waveform handle (**handle:** <**#:#**>) returned by the **wfc** command or a fully-qualified name in the following forms:

```
<database_name>waveform_name
```

```
<database/folder>waveform_name
```

For example:

```
<tutorial/Time-Domain_Results>v_middle
```

Example

```
set result [evalExpression {wf("<tutorial/Time-Domain_Results>v_load")-
wf("<tutorial/Time-Domain_Results>v_middle")}]

add wave <tutorial/Time-Domain_Results>v_load $result

# this will plot <tutorial/Time-Domain_Results>v_load and the
# result waveform
```

batch_mode — Checks if Tcl Program is Currently in Batch Mode

Usage

```
batch_mode
```

Description

This command indicates whether the EZwave application or the JWDB server is used, to check whether the Tcl script is currently in batch mode.

Return Values

1 if used with the JWDB Server (this indicates that the program is in non-graphical batch mode).

0 if used with the EZwave application (this indicates that the program is in graphical non-batch mode).

Example

```
if [batch_mode] {
...
} else { # execute graphical commands
add wave $wf
}
```

dataset open — Opens a Database File

Usage

```
dataset open <filename>
```

Description

This command opens a database file.

Parameters

`filename` — The name of a database in a supported format.

Return

The database name identifier (**handle:** <**#:#**>).

Example

```
dataset open $env(AMS_VIEWER_HOME)/lib/tutorial.wdb
```

evalExpression — Invokes the EZwave Waveform Calculator

Usage

```
evalExpression "<expression>"
```

Description

This command invokes the EZwave Waveform Calculator to calculate the expression entered.

If **expression** is enclosed in double quotes (**" "**), value substitution is enabled and all strings beginning with a dollar sign (**$**) are replaced by the variable they name. If an expression is enclosed in braces (**{ }**), value substitution is disabled and the expression is evaluated as presented.

This command differs from **wfc** in the type of output it returns.

Parameters

`expression` — An expression supported by the EZwave calculator.

Return Values

The result value of the expression. It can be one of the following:

- a list of Y-values corresponding to a waveform, represented as a Tcl list of strings
- a single number
- a list of data represented as a Tcl list of strings for a one-dimensional array
- a list of data pairs represented as a Tcl list of string pairs grouped by parentheses for a two-dimensional array

Example

```
evalExpression {wf_diff = wf("<tutorial/Time-Domain_Results>v_load") -
wf("<tutorial/Time-Domain_Results>v_middle")}

set diff0 [evalExpression {wftodata(wf_diff)[0][0]}]
```

wfc — Invokes the EZwave Waveform Calculator

Usage

```
wfc "<expression>"
```

Description

This command invokes the EZwave Waveform Calculator to calculate the expression entered.

If **expression** is enclosed in double quotes (`" "`), value substitution is enabled and all strings beginning with a dollar sign (**$**) are replaced by the variable they name. If an expression is enclosed in braces (**{ }**), value substitution is disabled and the expression is evaluated as presented.

This command differs from **evalExpression** in the type of output it returns.

Parameters

`expression` — An expression supported by the EZwave calculator.

Return Values

The result value of the expression. It can be one of the following:

- a waveform object handle
- a single number
- a list of data represented as a Tcl list of strings for a one-dimensional array
- a list of data pairs represented as a Tcl list of string pairs grouped by parentheses for a two-dimensional array

Example

```
set wf_diff [wfc {wf("<tutorial/Time-Domain_Results>v_load") -
wf("<tutorial/Time-Domain_Results>v_middle")}]

add wave $wf_diff
```

write wave — Print Waveform

Usage

```
write wave [ <file.ps> | [-printer <printer_name>] [-file <file.ps>]
[-window <window_name>] [-landscape] [-portrait]]
```

Description

This command outputs a waveform to a specified location.

Parameters

`-printer <printer_name>` — Sets the printer in the network.

`-file <file.ps>` — Sets the output file name in PostScript format.

`-window <window_name>` — Sets the window to be printed. In case no `-window` is specified, the active window is printed.

`-landscape` — Sets the printing orientation to be landscape (default).

`-portrait` — Sets the printing orientation as Portrait.

Return Values

None.

Tcl Scripting Examples

You can use Tcl scripting to issue batch commands to the EZwave waveform calculator. The **evalExpression** function allows full access to all the calculation operations of the waveform calculator.

In the following Tcl script example, **tut1_meas.tcl**, the **evalExpression** command is used to calculate several different waveform measurements. The script opens a waveform database file, **meas.wdb**, performs several measurement operations, and sends output to an ASCII file, **meas.out**.

```
#!/usr/local/bin/tclsh


# ####################################################
# additional user-defined procedures

proc greater {a b} {
    return [ expr { ($a > $b) ? $a : $b } ]
}

# ####################################################
# open database file

dataset open meas.wdb

puts "\nExtracting from EZwave Post Processing"

# ####################################################
# global parameter settings

# .param vdd=3.3
evalExpression { vdd = 3.3 }

# ####################################################
# .meas tran TD1 when v(in)='vdd/2' td=5ns rise=1
# .meas tran TD2 when v(in)='vdd/2' td=5ns rise=2

evalExpression { rt_in_ = risetime(wf("<meas/TRAN>V(IN)"), x_start = 5e-9,
baseline = vdd/2, topline = vdd/2, option = "wf") }
set TD1 [ evalExpression { td1_ = wftodata(rt_in_)[0][0] } ]
set TD2 [ evalExpression { td2_ = wftodata(rt_in_)[1][0] } ]

# ####################################################
# .meas tran T1 trig at=TD1
#               targ v(q0) val='vdd/2' td=5ns rise=1

evalExpression { rt_q0_ = risetime(wf("<meas/TRAN>V(Q0)"), x_start =
greater(td1_, 5e-9), baseline = vdd/2, topline = vdd/2, option = "wf") }
set T1 [ evalExpression { wftodata(rt_q0_)[0][0] - td1_ } ]

# ####################################################
# .meas tran T2 trig at=TD2
#               targ v(q0) val='vdd/2' td=TD2 fall=1
```

```
evalExpression { ft_q0_ = falltime(wf("<meas/TRAN>V(Q0)"), x_start =
greater(td2_, td2_), baseline = vdd/2, topline = vdd/2, option = "wf") }
set T2 [ evalExpression { wftodata(ft_q0_)[0][0] - td2_ } ]

# ####################################################
# .meas tran T2_C2 trig at=TD2
#                  targ v(q0) val='vdd/2' td=5ns cross=2

evalExpression { cr_q0_ = crossing(wf("<meas/TRAN>V(Q0)"), x_start =
greater(td2_, 5e-9), ylevel = vdd/2, slopetrigger = "either", option =
"value") }
set T2_C2 [ evalExpression { cr_q0_[1] - td2_ } ]

# ####################################################
# .meas tran T2_R trig at=TD2
#                  targ v(q0) val='vdd/2' td=5ns rise=last

evalExpression { cr1_q0_ = crossing(wf("<meas/TRAN>V(Q0)"), x_start =
greater(td2_, 5e-9), ylevel = vdd/2, slopetrigger = "rising", option =
"wf") }
evalExpression { last_ = size(cr1_q0_) - 1 }
set T2_R [ evalExpression { wftodata(cr1_q0_)[last_][0] - td2_ } ]

# ####################################################
# open an ASCII file for saving measurement results

# results are in nano-seconds
set unit {N}
set factor 1e9

set fileout [ open meas.out w+ ]
puts $fileout "\nExtracted from EZwave Post Processing"
puts $fileout [ format " TD1\t= %8.4f%s" [ expr $TD1 * $factor ] $unit ]
puts $fileout [ format " T1\t= %8.4f%s"  [ expr $T1 * $factor ] $unit ]
puts $fileout [ format " TD2\t= %8.4f%s" [ expr $TD2 * $factor ] $unit ]
puts $fileout [ format " T2\t= %8.4f%s"  [ expr $T2 * $factor ] $unit ]
puts $fileout [ format " T2_C2\t= %8.4f%s" [ expr $T2_C2 * $factor ] $unit
]
puts $fileout [ format " T2_R\t= %8.4f%s" [ expr $T2_R *$factor ] $unit]
close $fileout
```

This Tcl script can be broken down into several distinct functional areas:

- Adding User-Defined Procedures
- Opening a Database File
- Setting Global Parameters
- Taking Waveform Measurements
- Outputting an ASCII File

Adding User-Defined Procedures

You can use any Tcl native functions and define any procedures using Tcl syntax as in the following statements:

```
proc greater {a b} {
    return [ expr { ($a > $b) ? $a : $b } ]
}
```

Open a Database File

The database file **meas.wdb** is opened using the following Tcl statement:

```
dataset open meas.wdb
```

Setting Global Parameters

For the following **.param** statement in a SPICE netlist file, the value **3.3** is assigned to the parameter variable **vdd**:

```
.param vdd=3.3
```

The equivalent Tcl function is as follows:

```
evalExpression { vdd = 3.3 }
```

Taking Waveform Measurements

Electrical specifications (using the **.meas** command) are computed based on simulation results and typically printed to an ASCII file. You can use Tcl scripting to take the same measurements.

- In this example, after a specified time delay (**td**) of 5 nanoseconds, a measurement is taken to find the exact time when the signal **v(in)** crosses the voltage level **vdd/2** in the first rising event. The result is saved in the variable **TD1**. This code shows how this is implemented as a **.meas** statement in a SPICE netlist file:

  ```
  .meas tran TD1 when v(in)='vdd/2' td=5ns rise=1
  ```

  In a second **.meas** statement, after a 5 nanosecond time delay, a measurement is taken to determine the time when the signal **v(in)** crosses the voltage level **vdd/2** in the second rising event. The result is saved in the variable **TD2**.

  ```
  .meas tran TD2 when v(in)='vdd/2' td=5ns rise=2
  ```

  These two measurements (**TD1** and **TD2**) can be implemented using Tcl scripting as in the following example:

  ```
  evalExpression { rt_in_ = risetime(wf("<meas/TRAN>V(IN)"), x_start =
  5e-9, baseline = vdd/2, topline = vdd/2, option = "wf") }
  ```

```
set TD1 [ evalExpression { td1_ = wftodata(rt_in_)[0][0] } ]
set TD2 [ evalExpression { td2_ = wftodata(rt_in_)[1][0] } ]
```

- For a third **.meas** statement, after a 5 nanosecond time delay, a measurement is taken to find the difference between the result in TD1 and when the signal **v(q0)** crosses the voltage level **vdd/2** in the first rising event. The result is saved in the variable **T1**.

```
.meas tran T1 trig at=TD1

targ v(q0) val='vdd/2' td=5ns rise=1
```

The Tcl scripting equivalent to the **.meas** statement is as follows:

```
evalExpression { rt_q0_ = risetime(wf("<meas/TRAN>V(Q0)"), x_start =
greater(td1_, 5e-9), baseline = vdd/2, topline = vdd/2, option =
"wf") }
set T1 [ evalExpression { wftodata(rt_q0_)[0][0] - td1_ } ]
```

- For the fourth **.meas** statement, after a **TD2** time delay, the a measurement is taken to determine the difference between **TD2** and when the signal **v(q0)** crosses the voltage level **vdd/2** in the first falling event. The result is saved in the variable **T2**.

```
.meas tran T2 trig at=TD2
               targ v(q0) val='vdd/2' td=TD2 fall=1
```

The Tcl scripting equivalent is as follows:

```
evalExpression { ft_q0_ = falltime(wf("<meas/TRAN>V(Q0)"), x_start =
greater(td2_, td2_), baseline = vdd/2, topline = vdd/2, option =
"wf") }
set T2 [ evalExpression { wftodata(ft_q0_)[0][0] - td2_ } ]
```

- For the fifth **.meas** statement, after a 5 nanosecond time delay, a measurement is taken to find the difference between **TD2** and when the signal **v(q0)** crosses the voltage level **vdd/2** in the second crossing event, either rising or falling. The result is saved in the variable **T2_C2**.

```
.meas tran T2_C2 trig at=TD2
                 targ v(q0) val='vdd/2' td=5ns cross=2
```

The Tcl scripting equivalent is as follows:

```
evalExpression { cr_q0_ = crossing(wf("<meas/TRAN>V(Q0)"), x_start =
greater(td2_, 5e-9), ylevel = vdd/2, slopetrigger = "either", option
= "value") }
set T2_C2 [ evalExpression { cr_q0_[1] - td2_ } ]
```

- In the final **.meas** statement, after a 5 nanosecond time delay, a measurement is taken to find the difference between the time specified by **TD2** and when the signal **v(q0)** crosses the voltage level **vdd/2** in the last rising event. The result is saved in the variable **T2_R**.

```
.meas tran T2_R trig at=TD2
      targ v(q0) val='vdd/2' td=5ns rise=last
```

The Tcl scripting equivalent is as follows:

```
evalExpression { cr1_q0_ = crossing(wf("<meas/TRAN>V(Q0)"), x_start
= greater(td2_, 5e-9), ylevel = vdd/2, slopetrigger = "rising",
option = "wf") }
evalExpression { last_ = size(cr1_q0_) - 1 }
set T2_R [ evalExpression { wftodata(cr1_q0_)[last_][0] - td2_ } ]
```

Outputting an ASCII File

In the final section of the example Tcl code, the results of all measurements (**TD1**, **TD2**, **T2R**, and **T2_C2**) are output to an ASCII file, **meas.out**.

```
# results are in nanoseconds
set unit {N}
set factor 1e9

set fileout [ open meas.out w+ ]
puts $fileout "\nExtracted from EZwave Post Processing"
puts $fileout [ format " TD1\t= %8.4f%s" [ expr $TD1 * $factor ] $unit ]
puts $fileout [ format " T1\t= %8.4f%s"  [ expr $T1 * $factor ] $unit ]
puts $fileout [ format " TD2\t= %8.4f%s" [ expr $TD2 * $factor ] $unit ]
puts $fileout [ format " T2\t= %8.4f%s"  [ expr $T2 * $factor ] $unit ]
puts $fileout [ format " T2_C2\t= %8.4f%s" [ expr $T2_C2 * $factor ] $unit
]
puts $fileout [ format " T2_R\t= %8.4f%s" [ expr $T2_R *$factor ] $unit]
close $fileout
```

Appendix C
Linux Printing Notes

If you are having difficulties printing from a system running Linux, use the following steps to troubleshoot your printing process:

1. Ensure that */usr/sbin/lpc* is available on the machine.

   The Java Configuration Requirement for Linux states:
   "To print on Linux, the */usr/sbin/lp*c utility must be installed. This is a standard Linux utility. On RedHat 7.1, for example, this utility is in the 'LPRng-3.7.4-22 RPM' package."

   On RedHat 3.0, the CUPS package is sometimes used by default instead of LPRNG. The following commands can be used to check whether LPRNG or CUPS is installed on your system:

   ```
   rpm -qa | grep LPR
   ```

   If this command returns a package name, the LPRNG package is installed.

   ```
   rpm -qa | grep cups
   ```

   If this command returns a package name, the CUPS package is installed.

If You Are Using LPRNG:

1. Look for the following configuration files:
   /etc/printcap
   Verify that some printers are defined in this file. If this file does not exist, the EZwave application is normally unable to print. This file is automatically generated during printing configuration executed by the root admin.

   /etc/lpd.perms
   This file is optional. If it exists, verify that the following lines are present:
   ```
   # allow anybody to get server,
   status, and printcap
   ACCEPT SERVICE=C
   LPC=lpd,status,printcap
   ```

   /etc/lpd.conf
   This file is mandatory. It may be empty. If it is not empty, it may contain settings that prevent proper printing.

If You Are Using CUPS:

1. Execute the following command:
   ```
   /usr/sbin/lpc status
   ```
   This returns a list of printers with configuration and status details. For example:
   ```
   myprinter:
      printer is on device 'lpd'
   speed -1
      queuing is enabled
      printing is enabled
      no entries
      daemon present
   ```

2. Verify that the cups printer daemon is running with the following command:
   ```
   /bin/ps -auxww | grep cupsd
   ```
   A *cupsd* process must be running; otherwise, printing will fail.

(continued)

If You Are Using LPRNG:

2. If the preceding files are all correct, try the following command:
```
/usr/sbin/lpc status
```
This returns a list of printers with configuration and status details. For example:
```
myprinter:
   printer is on device 'lpd'
speed -1
   queuing is enabled
   printing is enabled
   no entries
   daemon present
```

3. Verify that the LPD daemon is running with the following command:
```
/bin/ps -auxww | grep lpd
```
An *lpd* process must be running; otherwise, printing will fail.

If You Are Using CUPS:

3. Verify that the following configuration files exist in the /etc/cups directory:
   - classes.conf
   - client.conf
   - cupsd.conf
   - mime.convs
   - mime.types
   - printers.conf

   This is the basic CUPS recommended configuration.

4. Log in to the machine as *root* and execute the following command:
```
lpstat -v
```
This should return address information on printers.
Look for the corresponding line for the printer named "myprinter". For example:
```
device for myprinter:
lpd://173.21.21.1/myprinter
```
Register the printer using the command:
```
/usr/sbin/lpadmin -r myprinter
-E -v lpd://173.21.21.1/
myprinter -m myprinter.ppd
```
Then, restart the cups daemon:
```
path/cups restart
```
path may be one of the following:
   - /etc/software/init.d
   - /etc/rc.d/init.d
   - /etc/init.d
   - /sbin/init.d

Glossary

A

active cursor

The currently selected cursor. It appears as a solid line; other cursors appear as dotted lines. Any operations performed on a cursor, such as deleting or moving between data points, affect the active cursor. The active cursor may be different from the base cursor.

active window

The window where waveforms are plotted when not using drag and drop. This is also the window used for menu bar and toolbar commands.

area zoom

The action when zooming in both the X and Y directions. Drag the mouse over the waveform itself to define the rectangular region to zoom to.

B

base cursor

The cursor used as a reference for various measurements involving other cursors. This cursor can be identified as the one that is flush with the X-axis and does not contain a delta-X value. The base cursor may be different from the active cursor.

baseline

Baseline is the magnitude reference line at the base magnitude, which is the magnitude of the portion of a pulse waveform that represents the first nominal state of a pulse (usually referred as LOW level).

C

comma-separated values (CSV)

An ASCII save format containing data values represented as comma-separated value pairs.

complex plane plot

A visual display of a complex-valued waveform in which the real values of the waveform are plotted on the X-axis against the imaginary portion on the Y-axis.

complex-valued waveform

A complex-valued waveform can be defined as any sound wave that is not sinusoidal. By the Fourier's theorem, any complex periodic waveform can be decomposed into a series of simple sinusoids that differ in the three defining attributes of amplitude, frequency, and phase.

compound waveform

A waveform that contains the results of several simulations for the same node. The EZwave application can perform operations on either the compound waveform or the individual elements that make up the compound waveform.

continuous

A waveform drawing mode.

cursor

A special on-screen indicator, represented as a vertical line (or as a point in some plots, such as a Smith chart), drawn in the waveform display area to identify locations or create a point for measurement. The first cursor created is set as the base (reference) cursor. The base cursor can be changed to allow delta measurements against other cursors.

D

drawing mode

The method in which a waveform is displayed in a Graph window. The drawing mode can be one of the following:

- **continuous** (default) — a piecewise smooth connection of the data points representing the waveform
- **sampled** — each data point is connected by a horizontal line to the X value of the next data point, with a vertical line connecting up or down to the next Y value
- **scattered** — each data point representing the waveform is plotted individually
- **spectral** — each data point is represented as a vertical line from the base of the row to the Y value of the data point
- **railroad** — the waveform is represented digitally as the value of the last data point encountered in the waveform

E

enumerated type

In VHDL, an enumeration type declaration defines a type that has a set of user-defined values consisting of identifiers and character literals. If a waveform is displayed in an enumerated format, text values are displayed in a box rather than graphical high/low waveform.

Event Search Tool

A tool that enables you to locate occurrences of simulation events interactively. An event is a definition of specific states or values for a single waveform or collection of waveforms.

G

Graph window

Graph windows display waveform data. Waveform data can be spectral data, comma separated value data, or analog and digital data.

I

input unit

The unit of measure for a waveform. The unit of the result waveform is same as the unit of the input waveform. By default, the unit of measure is set globally, however, setting the unit locally will override the default setting.

J

Joint Waveform Database (JWDB)

The default database format for Mentor Graphics simulation applications.

M

Measurement Tool

A tool that performs a variety of analog and mixed-signal measurement operations on waveforms displayed in the Graph window. Results from the Measurement Tool can be annotated in the Graph window along with the measured waveforms.

mouse strokes

Mouse strokes provide you with a convenient way to perform common tasks by allowing you to draw shapes using the mouse. For example, drawing the letter “D” deletes the current set of selected objects. Mouse strokes are usually performed with a three button mouse using the middle mouse button to make the stroke.

O

over-axis zooming

The action that uses the mouse pointer to drag over the X or Y axis to identify the region for zoom.

overlaid plots

The ability to plot multiple waveforms on top of each other in the same row within the Graph window. You may plot analog and digital waveforms overlaid. Existing digital waveforms rows cannot accept overlaid plots.

overlaid waveforms

Two or more waveforms that are plotted on the same X- and Y-axis in a Graph window (that is, in the same row). Compare these to stacked waveforms.

P

polar chart

A visual display of a waveform against a grid of polar coordinates.

PWL (Piecewise Linear Function)

See SPICE PWL (Piecewise Linear Function).

R

radix

A quantity whose successive integral powers are the implicit multipliers of the sequence of digits that represent a number of some positional-notation systems. Radices used with buses include Two's Complement, Octal, Hexadecimal, Binary, and Decimal.

railroad

A waveform drawing mode.

row

A single unit of display in a Graph window. A row can be a digital row, containing a digital waveform, or an analog row, containing one or more analog waveforms; additionally, you can add a single digital waveform to overlay an analog row. Each row has an individual Y-axis display; this display can contain one or more Y axes. The properties of a row can be changed by right-clicking in the row and choosing items in the popup menu. For example, you can adjust whether a row has grid lines, set the height of the row, and give the row a display title.

S

sampled

A waveform drawing mode.

scattered

A waveform drawing mode.

Smith chart

A visual display of a sequence of impedance (Z-parameters), admittance (Y-parameters), scatter parameters (S-parameters), or reflection coefficient data plotted as curves on a grid.

spectral

A waveform drawing mode.

SPICE PWL (Piecewise Linear Function)

An ASCII save format representing a waveform as a piecewise linear function.

stacked waveforms

Two or more waveforms that are plotted on different Y-axes in the same Graph window (that is, in different rows). Compare these to overlaid waveforms.

T

topline

Topline is the magnitude reference line at the top magnitude, which is the magnitude of the portion of a pulse waveform that represents the second nominal state of a pulse (usually referred as HIGH level).

V

value flag

A box displaying the value of a cursor at its intercept on the waveform. The value flag may also contain a delta-X measurement from the base cursor.

view all

The action where the magnification is reset to view all of the data in a window or a row within the active Graph window.

W

waveform

A waveform is a collection of values along a time continuum, frequency, or other domain axis. The axis is referred to as the *domain*, and the values positioned along the axis are the *range*. This is really a logical view, as some waveform events, in other words. those that are part of a functional waveform, may be generated by a function (for example, sin(t)).

Waveform Calculator

A post-processing tool that allows you to perform advanced analyses or debugging on plotted waveforms. The Waveform Calculator supports a variety of built-in functions as well as user-defined functions.

waveform database

A waveform database contains data describing one or more individual waveforms.

waveform list panel

A panel at the left side of the workspace that displays a list of currently available waveforms and databases.

workspace

The main work area of the EZwave application, where the Graph windows are displayed. The workspace is located directly below the toolbar on the application window.

X

X-axis domain

Also known as *waveform type*. This refers to the measurement type of the X-axis of a row in a Graph Window and can be one of time-domain, frequency-domain, parametric, and so forth. Waveforms with incompatible X-axis domains cannot appear in the same Graph window together.

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